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SOME ARTISTIC BRONZES OF OLDEN TIMES

By Isabelle M. Archer.

An unusually interesting collection of paintings and art objects, which was on view this winter at the Anderson Galleries (Madison avenue and 40th street), comprised the V. G. Fisher collection from Washington. Mr. Fisher, having closed his galleries in this city, has established himself in New York, where he will deal only in "Old Masters." The bronzes included in the exhibition attracted attention on account of the variety in the assortment and the bold workmanship of the older pieces.

BRONZE CLOCK AND CANDELABRA OF FRENCH WORKMANSHIP OF THE TIME OF LOUIS XVI.

The Japanese bronzes were especially worthy of notice. The oldest piece shown was a bell from the Shotokuzi Temple. It was made at the best period in the industry, just after Tokugava Iyeyasu ascended to the Shogunate in 1603. That mighty ruler brought peace to Japan, and the arts, flourishing, advanced to their highest point of excellence. One of the most noted bronzes of this age of the Tokugava Shoguns is the Buddha in Kioto. It was cast in 1614 and the temple bell in the Fisher collection is probably of the same alloy and workmanship as that great bronze.

The exact composition of the temple bronzes is difficult to determine on account of the conglomerate mass of offerings and accumulations of metal objects that were thrown into the alloy, but the base of all the old ornamental bronzes is "karakane," the word meaning Chinese metal, the formula having been brought to Japan from China. Karakane is differentiated from the harder bronzes by the use of lead in its composition and resembles the alloy used by the ancient Greeks and Romans in the making of their arms and armor. The ideal proportions for karakane are: Copper, 88; tin, 7; lead, 5; total, 100; but the mixture varies considerably in the old coins and pieces that have been tested, often running to: Copper, 77.33; tin, 4.33; lead, 15.33; with some zinc, also, in the composition. The low melting point of karakane, and the fluidity when melted, recommended its use to the Japanese bronze workers for their ornaments, and it is of this metal that the principal pieces in the collection were formed.

One very old piece was a Sentoku fire-pot. It is in the shape of a wide-mouthed jar, and would make a very handsome jardiniere. The lower part is engraved in a branching flower decoration, and the handles are formed of elephants heads, the trunks of the animals being the

upper part of the handles. Some old kettles of iron had bronze covers and handles, and one was entirely of bronze. A large kettle is carved in high relief with a decoration of fishermen carrying baskets of fish. Another kettle, in the form of a gourd, has a lid of carved chrysanthemum petals. The work on these kettles seems worthy of gracing objects of more intrinsic value than

ORMOLU CLOCK ON ORMOLU TABLE. TIME OF LOUIS XVI.

are cooking utensils, for the care taken in the casting, and the art shown in the designing of the pieces, is remarkable.

There were half a dozen vases, each with a different motif in their decoration. A lizard of a conventional design is coiled gracefully around the neck of one vase. The claws and the trimmings around the head of the lizard are finely modeled, and the whole is smooth and cleancut. Another vase, or water jar, is in the form of a goose neck, and the feathers on the base are very realistic.

A large jardiniere was very handsome, and the surface marvelously smooth. The Japanese use the "descending" method of casting, but they have modified and improved it to a great extent by placing tiers of ingates around the cast instead of having them only at the top. This prevents the forming of "cold sets" by giving passages of escape for the air, thus ensuring an even surface on the finished bronze, and the larger pieces in the collection proved the infallibility of the Japanese method of casting.

The stain, or "patina," noticed on some of these Japanese pieces is a difficult color to obtain. After the bronze is cast it is immersed in a pickle. This pickle is a solution of plum vinegar and water, with copper and iron sulphates. To obtain a very rich dark brown, the bronze, after being in the pickle bath, is left in the open air or buried in earth. Either process takes months to complete, the latter being the slower method. The deep, rich color of the old temple bell, the fire-pot and the large jardiniere, has been obtained by this tedious process.

The old Japanese art founders had unlimited patience, and they achieved success in the casting of bronzes with tools and methods that were extremely primitive, and

BRONZE CLOCK OF BOULLE MARQUETRY OF 18TH CENTURY.

yet the modern equipped foundry finds this work hard to equal.

A group of antique bronzes included some small statuettes of Italian and French craftsmanship, and the artisans of the 16th century were well represented by some fine bronzes, examples which, by their artistic qualities, are an inspiration to modern workers. A number of very handsome clocks are marvelously wrought and finished. Sets of a clock and two candelabra to match, large bronze sconces and candlesticks, all show good workmanship. The Louis XVI clock and candelabra, which are shown in the accompanying illustration,

are very beautiful. The figures are delicately modeled and carved, and the minute details of the decoration are brought out wonderfully. The group represents the muses of music and poetry, and the amorino at the left of the two center figures is holding, open, the book of fame. The candelabra have each eight gilt bronze branching arms in two alternating designs. The figures on these pieces are well balanced and strong and the handsome bases give a dignified finish to the design. The color of this work is particularly pleasing. It is a warm gold tint not often seen in the bronzes of the Louis XVI period. Some candlesticks of gilt bronze, also of the 18th century, France, has fine fluted pedestals rising from bases of grapes and acanthus leaves and a pair of sconces are decorated with trophies of the chase. A grotesque mask formed the motif for the design of a light bronze sconce. The branch holding the candle projected out of the top of a group of acenthus leaves that are placed at the top of the mask.

An ormolu clock which is illustrated here, is beautifully wrought in a design of the Louis XVI style. The legs of the clock rest on an ormolu table of a rococo pattern. The case is decorated with musical emblems and on the top of the case is an amorino under a carved metal lattice canopy. The sides of the clock case are decorated with an openwork scroll flower pattern. The hands are of carved bronze and the whole piece is exquisitely engraved and finished. Included in the bronzes were some handsomely decorated crosses and religious pieces in the form of plaques, groups of figures and panel pictures. Good examples of home decoration were the trimmings for doors and door knockers. Two queer little monkeys in costume are used for the base in a pair of door pulls; the handles, large circles of bronze, are fixed outright from the door. These have been cleverly cast, but are rather light in color. A lock ornamented in gilt metal on the face, with a pierced steel back, bears the date "1776." It is a good study in design and the workmanship is excellent.

There were some bronze plaques, one by Clodion, and another by Andre Riccio, and an upright plaque by Sarah Bernhardt. A number of clocks of boulle marquetry in the collection were remarkable in design and craftsmanship. One tall hall clock was finished with applied pieces of bronze for decoration, and a bronze figure of Father Time surmounted the case. The mountings of the clock of boulle marquetry in the third illustration are of bronze, and it has a beautifully engraved pendulum and bronze dial. The porcelain hour and minute plaques are set behind the dial and the metal work forms a framework around the numbers. The pendulum hangs behind glass and is half hidden by the bronze decoration on the front part of the case. The patience and skill of the craftsman is clearly proved by this clock. A study of the delicate marquetry and minute detail on such pieces of the 18th century would be of great value to the modern worker.

COPPER AND ITS ALLOYS IN EARLY TIMES*

By William Gowland, Assoc. R. S. M., F. R. S.

With the discovery of metals and notably the application of copper and its alloys in Neolithic times, we have one of the great turning points, if not the greatest, in the history of human development, the first-birth of the germs of that civilization and culture to which we have attained at the present day. The discoveries of the properties of steam and electricity and their applications to our industries and other practical purposes of life we are apt to regard as wonderful and epoch making, yet when we compare them with the results which have followed the discovery of metals, they are but trifling and insignificant.

The order in which the metals were discovered was not the same for every region, as their ores are very capriciously distributed in the world, and it is extremely probable, if not absolutely certain, that the metals which occur native, *i. e.*, those which occur as metals in nature, must have been first known to the men inhabiting the localities in which they occurred. The metals so occurring most frequently are gold and copper. The former is much more widely distributed than the latter, and must have been the first metal to be known in many regions.

It is, however, one of the most worthless metals for practical purposes, so that until the rise of Greek and Roman civilization but little use was made of it. Copper, too, we only find in use to a very limited extent, as it was not well suited for the construction of weapons or useful implements. On the other hand, its alloy with tin afforded a metal which in many physical properties could only be surpassed by iron or steel. According to the views of several ancient writers, Lucretius and Poseidonius, so momentous a discovery as that of metals contained in ores must needs have been brought about by no uncommon cause.

According to them, a conflagration consumed forests which covered the outcrop of metalliferous veins, reducing the metals and bringing them to the notice of man, but there are no grounds for such inference. The discovery of metals other than "native" had no such poetic origin, but was brought about in a more commonplace and more humble way. It had its origin in the domestic fires of the Neolithic Age.

The extraction of the common metals from their ores does not require the elaborate furnaces and complicated processes of our own days, as pieces of ore, either copper carbonate or oxide, cassiterite, cerusite, or mixtures of these, and even iron oxides which by chance formed part of the ring of stones enclosing the domestic fire, and which became accidentally embedded in its embers, would become reduced to metal. The camp fire was, in fact, the first metallurgical furnace, and from it, by successive modifications, the huge furnaces of the present day have been gradually evolved.

First, a shallow cavity would be formed in the hearth of the fire for the reception of the molten metal, and this would be made larger as time went on and larger quantities of metal were required by deepening it or by surrounding it with a higher wall of stones. Furnaces of precisely this primitive form survived in Derbyshire up to the seventeenth century. In Japan the furnace for smelting copper, tin, and lead ores, a mere hole in the ground, which was in universal use there up to 1858, and is still extensively employed, is as simple and rude as that of the men of the Bronze Age.

The alloys of copper and tin during the early Metal Age, and even somewhat later, were obtained not by melting together copper and metallic tin, but by the reduction of oxidized copper ores containing tin-stone, or of copper ores to which tin-stone was added. As it has been stated by several continental archæologists that when a copper ore containing tin ore is smelted the tin does not enter into combination with the copper, but passes into the slag, I have made several experiments under the condition which were available to prehistoric man, which completely disprove their statements.

*Presidential address, January meeting of Institute of Metals, London, England.

A furnace of the simplest form, merely a hole in the ground, was constructed in my laboratory at the Royal School of Mines (Fig. 1). The fuel used was charcoal. A mixture of copper ore (green carbonate) and tin-stone was smelted in it, and a copper-tin alloy, a bronze containing 22.0 per cent. of tin was obtained.

The experiment was repeated several times, and in every case copper-tin alloys were obtained. See Appendix for details.

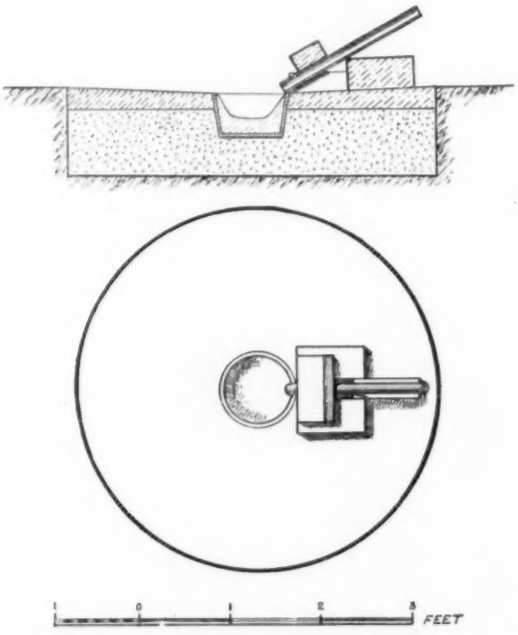


FIG. 1. FAC SIMILE OF ANCIENT FURNACE.

This experiment proves indisputably that when a copper ore containing tin ore was smelted by primitive man, a bronze consisting of copper and tin was the result.

The shape and structure of the lumps of copper which have been found in the founders' hoards* of the Bronze Age afford valuable evidence as to the size of the rude smelting furnaces, the method of smelting, and the manner in which the metal was removed from the hearth.

These lumps are always fragments of rudely disc-shaped cakes of about 8 ins. to 10 ins. in diameter, and 1½ ins. in thickness, having the largely columnar fracture of copper when broken near its solidifying point.

They show that the furnace was simply a small shallow hole or hearth scooped in the ground, about 10 or 12 ins. in diameter, and that the operation of smelting must have been conducted as follows: A small charcoal fire was first made in the hearth, and when this was burning freely a layer of ore was spread over it, and upon this a layer of charcoal, then alternate layers of ore and charcoal were added in sufficient quantity to yield a cake of copper. The fire was doubtless urged by the wind alone in the earliest times, but later by some kind of bellows.

When all the charge had melted, the unburnt charcoal and the slag were raked off. The metal was not laded out, but was allowed to first solidify, and at the moment of solidification was rapidly pulled out and the cake broken up at once on a large stone. In Korea, at the copper mine of Kapsan, this primitive method of removing the copper from the furnace still survived when I traveled through the country in 1884.

The method of smelting copper ores in the primitive furnace which has survived in Japan from prehistoric times closely resembles that of the Bronze Age. A description of it will be found in my May lecture, 1910.*

FIG. 2. BRONZE FLAT AXES (BRITISH MUSEUM).

Some typical examples of flat bronze axes in the British Museum are shown in Plate I, Nos. 1, 2, 3, 4 and 5. Each of these I have analyzed, and their composition is given in the following table:

TABLE II.—Bronze Flat Axes, British Museum.

Locality.	Copper, per cent.	Tin, per cent.	Lead, per cent.	Iron, per cent.	Nickel, per cent.	Arsenic, per cent.	Antimony, per cent.	Silver, per cent.	Sulphur.
1. Taxley Fen, Huntingdonshire..	89.72	8.99	Trace	0.16	0.11	0.68	0.15	0.09	Nil.
2. Yorkshire (Butterwick).....	87.97	10.74	Trace	0.10	0.06	0.56	0.15	0.16	...
3. Cambridgeshire	87.41	11.04	Trace	1.22	0.11	Trace	Nil	Trace	...
4. Plumpton Plain, near Lewes..	86.79	11.34	Trace	0.14	0.37	0.78	0.31	0.17	Manganese, trace,
5. New York.....	85.83	11.73	1.21	0.10	0.14	Nil	Nil	Trace	...
6. Ireland	86.20	12.52	Trace	0.19	Nil	0.68	0.26	0.21	...

*Founders' hoards, many of which have been unearthed in this country and in Europe, contain generally worn-out or broken implements, waste castings, and rough lumps of copper apparently brought together for recasting. In some the objects are new and ready for use or are in an unfinished state. They appear to have been the stock-in-trade of itinerant founders who would thus introduce the art in different localities. A flat axe made of the alloy is in the British Museum.

The copper of the Bronze Age resembles modern blister copper in composition, but, unlike it, it often contains only traces of sulphur. When sulphur is present in the crude metal only in traces it undoubtedly indicates that the metal had been obtained by smelting oxidized ores.

*Journal of the Institute of Metals, No. 2, 1910, vol. iv, p. 21 *et seq.*

The percentage of copper in several characteristic specimens ranges from about 97.0 to 99.0.

The following, Nos. 1 and 2, are complete analyses which I have made of two specimens from Ireland. No. 3 is one by Dr. Helm of a specimen from Posen:

	No. 1. Per Cent.	No. 2. Per Cent.	No. 3. Per Cent.
Copper	96.99	98.95	99.16
Tin	0.08	0.17	0.05
Lead	0.06	Trace	0.03
Iron	0.30	0.20	0.08
Nickel	Trace	Trace	0.02
Arsenic	2.17	Trace	0.51
Antimony	Nil	Nil	....
Silver	0.21	0.35	....
Sulphur	Trace	Trace	0.03

From its high percentage of copper and comparative freedom from impurities, except arsenic, the Posen specimen must have been obtained either from a very pure ore or been submitted to a refining process.

In Ireland and one or two districts in Europe the earliest implements are of copper, in North America of native copper, but wherever the copper ores contain tin they are of a copper tin alloy.

ALLOYS OF THE BRONZE AGE.

I will now ask for your attention to the earliest alloys of copper and tin, those of the Bronze Age. In the production of these alloys in the earliest part of the Age, copper ores containing cassiterite can alone have been used; it is obvious, therefore, that the percentage of tin they contain must have varied with the percentage of cassiterite in the ore and the regularity with which the smelting operations were performed. Even in the later period of the Bronze Age, when the alloys were made by smelting the copper ore with cassiterite, alloys of definite composition can only have been accidentally obtained. Further, it is very questionable whether the metal tin was ever employed in making the alloys until the Iron Age was well advanced, as this metal has never been found in the founders' hoards. Consequently the implements and weapons are of very varied composition, at first generally containing but little tin, less than 3 per cent., but later having that metal frequently in satisfactory proportions for the uses they are intended for.

A curious feature of the alloys which the early weapons were made of in Hungary is the presence of antimony as an important constituent instead of tin. This doubtless arose from the alloys having been prepared by smelting the antimonial copper ores which occur in that country. A notable example analyzed by Dr. Helm had the following composition:

	Per Cent.
Copper	91.12
Antimony	4.48
Tin	0.78
Nickel	0.61
Arsenic	0.32
Lead	1.63
Silver	0.45
Iron	0.49
Sulphur	0.12

Axes made of these alloys would be fairly serviceable on account of the hardness produced by antimony in copper. We hence find them in use, with antimony largely replacing tin, until late in the Bronze Age.

It has been frequently stated that the alloy used by the men of the Bronze Age generally consists of copper and tin in the proportion of 9 to 1. I have hence compared the analyses which have been published, with the following results:

Early Weapons and Implements—57 Analyses.
In 25 the tin ranges from about 8 to 11 per cent.
" 6 " " " " " 11 " 13 "
" 26 " " " " " 3 " 8 "

Later. (Palstraves and Socketed Axes)—15 Analyses.
In 13 the tin ranges from about 4.3 to 13.1 per cent.
" 2 " " was about 18.3 per cent.

Spear and Lance Heads.
In 5 the tin ranges from about 11.3 to 15.7 per cent.

Still later. Swords—23 Analyses.
In 14 the tin ranges from about 8 to 11 per cent.
" 12 " " " " " 12 " 18 "
" 7 " " is less than 9 per cent.

It is obvious, therefore, that these statements do not accurately represent the facts. And if we consider the different uses to which they were put, it is evident that no single alloy could be equally suitable for all. For certain uses an implement of copper, or of an alloy containing but little tin, would be efficient. On the other hand, for a sword or dagger certain physical properties are essential that are not needed for an axe; thus, while 10 per cent. of tin or somewhat less would be satisfactory for the latter, a higher percentage, say from 11 to 14, would be required for the former. It is worthy of note that these proportions appear to have been frequently attained, and for this the men of the later Bronze Age are deserving of great credit as metallurgists and workers in metal.

The difficulties the earliest men had to contend with were extremely great, for it is self-evident that alloys of definite composition could not be ensured by the early practice of smelting mixtures of ores. It would seem, therefore, that when we find weapons or implements of suitable composition for their intended use, some physical tests must have been applied to the furnace product before it had been used for their manufacture.

PREHISTORIC METHODS OF METAL MANUFACTURE.

We will now pass on to a brief consideration of the methods followed by prehistoric man for the manufacture of his weapons and implements. Practically all copper celts were cast in open molds, as if cast in closed molds they would be more or less vesicular and worthless, except when the copper contained arsenic, tin, antimony, zinc or nickel in not less proportions than 1 per cent., or an excess of cuprous oxide. The remains of his appliances which have been found show clearly that the metal from the smelting operation was remelted in crucibles and poured from them into molds of clay or stone (Fig. 2), perhaps of sand, but of this there is no definite evidence. The metal was not laded from the smelting furnace, as the small crucibles with rude handles which have occasionally been found, and have been erroneously supposed to be ladles, show no signs of having been exposed to a high temperature both on the inside and outside, as would have been the case had they been so used; the interior and upped edges alone bear marks of such exposure. The reason for this will be seen later.

(To be Continued.)

MINERAL PRODUCTION OF ONTARIO.

[From United States Consul A. G. Seyfert, Owen Sound.]

The production of the metalliferous mines and works of the Province of Ontario for the first nine months of 1911 was: Gold, 2,276 ounces ($42,320); silver, 23,185,860 ounces ($11,593,286); copper, 6,769 tons ($967,489); nickel, 12,711 tons ($2,731,575); iron ore, 172,868 tons ($437,650); pig iron, 296,856 tons ($4,482,635); white arsenic, 3,016,385 pounds ($45,535); cobalt and nickel oxides, 277,766 pounds ($80,372). This is an increase of $1,799,629 in the production of silver and $13,591 in gold over the first nine months of 1910.

THE BEHAVIOR OF HEATED ZINC

By James Scott.

The actions of zinc, while being heated to form the oxide, are of a very remarkable character, and are illustrated herewith. I will refer to the details of the process later on, after I have briefly described the main sources whence zinc is procured. It hardly needs stating that this metal is never found in a free state in nature. Blende, calamine (*i. e.*, a carbonate) and hemimorphite (otherwise electric calamine and smithsonite), are the ores containing it in commercial abundance, the first two being by far the most important. The two kinds of calamine generally occur in veins that carry the blende, and may be pale yellow, pink, brown, green, or colorless. Sometimes the constituents are mixed together in a fine yellow powder called *dry bone* by miners. Occasionally the ores are observed in masses resembling stalactites. The blende contains zinc and cadmium as sulphides. The cadmium being more volatile than its companion metal, is released first during the subsequent treatment of the ores. There is also a red ore which does not seem to possess any particular name, to which one may refer it for universal identification. The ores are roasted while currents of air have access to them. To the resulting oxide small coal is then added, and when heat is applied to the mixture the metal is separated. For this latter process gas-fired furnaces are adopted, containing regular sets of retorts in which the ores are held. The product therefrom is melted and refined in a reverberating furnace, any lead present settling below the zinc. Final purity is obtained by redistilling the substance.

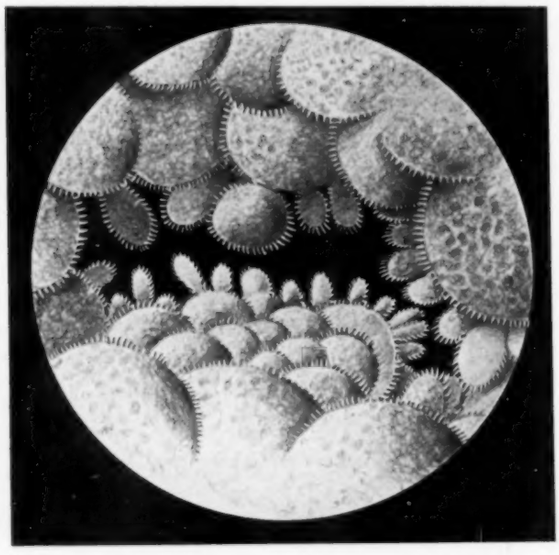


FIG. 1. A MAGNIFIED PINHOLE VIEW OF ONE PHASE OF MELTING ZINC, SEEN FROM ABOVE.

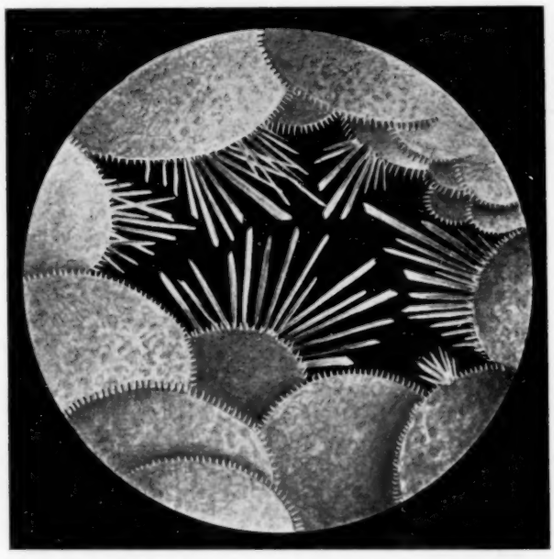


FIG. 2. A MAGNIFIED PINHOLE TOP VIEW OF ONE STAGE IN THE CHANGE OF HEATED ZINC TO OXIDE.

Zinc becomes malleable at a temperature between 100 degs. C. and 200 degs. C.; melts at 419 degs. C.; and boils at 925 degs. C.

On account of the freedom of zinc from being seriously affected by climatic changes, it is found to be exceptionally useful as a roofing material, especially in cases where lead would prove inconvenient or impossible. Of course, its most widely used condition is as a surface to corrugated iron, etc. We have only to notice the enormous output of galvanized goods to become aware that, in the absence of zinc, trade and domestic life would be hampered to a very great extent. Galvanizing attracted attention about the year 1840, and has been increasingly popular since. Iron articles, when about to be galvanized, are pickled in acids and scoured with sand; and are then dipped in baths of molten zinc covered with chloride of ammonia, which acts as a flux. Electrolytic deposition also has found favor for the better classes of galvanizing. Many of the salts of zinc are of great service in different directions. As an instance, the sulphate—*i. e.*, the metal dissolved in sulphuric acid—is very astringent, and is therefore of inestimable use by physicians for the purpose of relieving and curing ulcers and other sores. It has also proved successful as a rapid emetic in cases of poisoning, though it is itself a poison if not carefully dealt with. Zinc chloride, a white deliquescent mass, obtained either by treating the carbonate or the metal in hydrochloric acid, furnishes the surgeon, in a solid state, with a valuable caustic. It is none the less a very irritant poison. It also provides the metal worker with a good flux. One of its most peculiar applications is as an agent for increasing the weight of cotton cloth.

Perhaps the most attractive state of zinc is seen during the conversion of the metal into the oxide, a white powder which constitutes the essential basis of the effective paint Chinese white. After making many experiments I consider that the most effective manner of demonstrating the changes of zinc to oxide, on a small scale, is by means of a clean red-hot poker. Of course, it is impossible to properly study the minute modifications that transpire in the huge furnaces in which it is converted; but as the necessary temperature must be about the same in all cases, our humble poker will provide us with a means of ascertaining the physical aspects of such combinations.

After withdrawing the red-hot poker from the fire I let fall onto it, from the end of a knife blade, some pure zinc powder, this being in so fine a state of sub-division that the manifestations were more easily made.

Almost immediately an incandescent green-tinted blaze arose. Simultaneously, the vapor that emanated formed filmy *white* clouds that broke up, after wafting about the room for a while, into small flakes that fell like scraps of soft wool. Of course, this latter appearance was only

superficial, since under the microscope the light, frail stuff—the oxide—was found to be composed entirely of atoms of matter held together in very slender contact. Sometimes a long tongue of oxide would remain adherent like the ghost of a flame, after the greenish glare had become extinguished. It was a highly interesting procedure to investigate the details of structure of the white substance which remained as a coating over the cooled poker. Close examination with the naked eye showed this to be perforated with small openings whence some of itself had been vaporized. Several of the magnified sights resembled miniature nests full of tiny eggs.

The most characteristic appearances which I encountered were those now illustrated. These are not fancy sketches, bear in mind; but are novel delineations of the substance as I saw it, without removing it from the poker, after burning the zinc to the oxide. The conclusions I arrived at were as follows: As the oxygen is absorbed the modified zinc settles round minute globular or cylindrical bubbles of the gas, and these are succeeded by relays of globules from beneath. While there is sufficient heat, these objects are forced into long separate shafts, by the breakage of the horizontal partitions or connections of the bubbles with each other. As the free gas rushes up it pushes the walls of the altered globules aside, making them appear as upright or sloping fluted layers. These in turn become split up lengthways into strips, resembling needle crystals with neatly-shaped oblique ends, which seemed to fall over on their sides in the larger openings caused by the departure of the surrounding substance. These phases can be seen in Nos. 2 and 4.

The roofs of many of the elongated bubbles were blown off, to form the woolly flakes, leaving cups fringed with globules of smaller diameter, as in No. 4. It should be remembered that the surface layers were more porous, while the under ones, partly covered by those above, were more like globules of an egg shape, as in No. 1, capable of being expanded upwards into the patterns of cottage loaves. I noticed that right on top of the substance, on the ridges of the mounds, as it were, the transformed metal was separated so as to mimic tiny trees. No. 4 exhibits these details. I judged that where the divided columns or globules were erect they were split up into foliage-like atoms; but that when they extended over pits they were cleaned into crystalline forms. A prominent feature of the spectacle was the presence of conical bubbles, each bearing on its summit a tiny ball of the pure, glistening metal, which shone like a brilliantly polished dome in each case. No. 3 illustrates this phase.

The reader should note that the illustrations depict mere pinhole spaces, so that we have revelations of a unique kind. All the drawings are on the same scale of magnification. The purest Chinese white—*i. e.*, zinc oxide—has a definite brownish tinge when enormously magnified, thereby proving that the reflection of the light is important in producing the glaze.

After the distillation of the selected zinc oxide (white) it is made red-hot, and is then submitted to great pressure to constitute the best quality Chinese white. A poor imitation is obtained by treating zinc chloride with lime water.

It may be worth while mentioning that by placing a disc of zinc and a copper coin, respectively, above and below the tongue, allowing their front edges to come into contact with each other, a distinct electric shock is felt, this being accelerated by the peculiar character of the saliva.

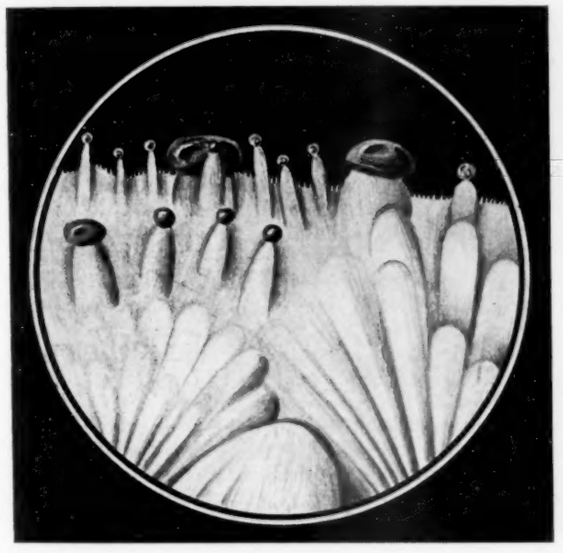


FIG. 3. A MAGNIFIED PINHOLE VIEW OF ONE PHASE DURING THE CHANGE OF HEATED ZINC TO OXIDE; SEEN SIDEWAYS.

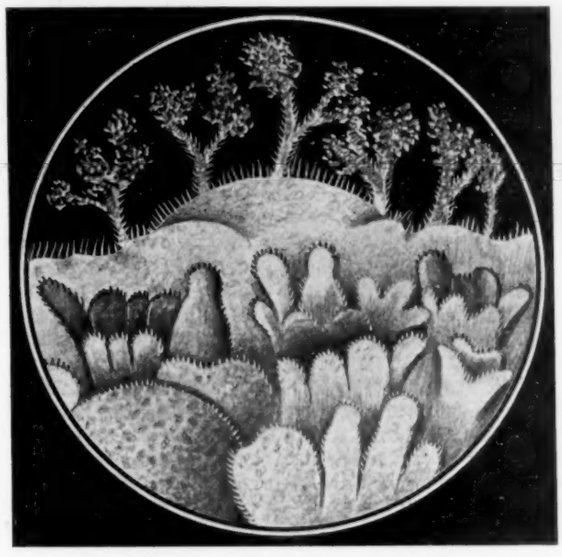


FIG. 4. A MAGNIFIED PINHOLE, SIDE VIEW, OF THE MODIFICATION OF ZINC TO OXIDE DURING THE HEATING OF THE METAL.

GERMAN BRONZE-POWDER INDUSTRY.

(From United States Consul George Nicolas Ifft, Nuremberg.)

Nuremberg is the center of the bronze-powder industry in Germany. With the exception of one factory at Munich and one at Frankfort-on-the-Main, all bronze-powder factories of any magnitude are located in Nuremberg and Fuerth and the smaller towns in this vicinity.

There are here fifteen to eighteen concerns of considerable extent and about twenty-five smaller factories, which employ an aggregate of 1,200 workmen and turn out an annual product of the value of about $3,000,000. Experienced workmen are paid 9 to 10 cents per hour and work ten hours a day, except on Saturdays, when eight hours is the rule. The few men employed in the foundry departments are slightly better paid—about 12 cents per hour. Juvenile employees average about 7 cents per hour. Practically no female workers are employed. Almost without exception factories are located where cheap water power may be had.

THE ELECTRO-DEPOSITION OF COBALT, WITH A SHORT ACCOUNT OF ITS HISTORY, PROPERTIES AND USES.

By Emmanuel Blassett, Jr.

HISTORY AND OCCURRENCE.

Cobalt in some form, apparently, was not unknown to the ancient Greeks and Romans, as it has been found in their pigments, for which purpose it is chiefly used today. It is mentioned in the writings of Agricola, Paracellsus and Basil Valentine, as a term to designate ores with a metallic appearance, but from which no metal could be extracted. The name cobalt is derived from the German word *kobold* applied originally by the miners of Saxony to the evil spirit of the mines, whom they supposed deluded them with a mineral rich in appearance, but from which no metal could be obtained on smelting. To this malicious spirit was attributed also the illness that afflicted the miners in mining cobalt ores, due no doubt to the presence of arsenic and sulphur.

It is to be noted that cobalt was discovered about twenty years before nickel, which it closely resembles in physical and electro-chemical properties. Its elementary character was first established by Brandt, in 1733, while investigating the blue coloring produced by *smalte*, a compound of cobalt oxide, quartz and potassium carbonate. However, very little was known about cobalt until Bergman thoroughly investigated it in 1780. The first to produce it in a pure condition seems to have been Deville in 1857. It is never found uncombined in nature, except in very small quantities in meteoric stones or aerolites. It is said that its presence has also been detected in the sun. It is generally found in combination with arsenic and sulphur in the minerals smaltite and cobaltite, the ores also containing at times nickel, copper, manganese, bismuth and iron.

Cobalt ores are found in various parts of the world but, as yet, at no place in abundance. Mines for producing cobalt in Europe are at Shneeberg, Germany; Modun, Norway; Tunaberg, Sweden; Musen in Rhenish Prussia, and Freyberg, Bohemia. Cobalt has also been mined in Bolivia and in the Transvaal, South Africa. It has been found in comparatively large quantities in the Tamiskaming district, Canada. Some years ago an ore containing cobalt and arsenic was discovered near Chatham, Conn., but not in quantities sufficient for mining to advantage. The only domestic production seems to be at a mine in Lamotte, Mo., all of the cobalt being obtained as a by-product in smelting lead ores. This mine has produced, according to government reports, as high as 120,000 pounds of cobalt oxide or more yearly, the production occasionally falling as low as 4,000 pounds or less. Many thousand pounds of cobalt oxide are imported annually from other countries. The metal may be obtained in the free state by strongly heating cobalt oxide with charcoal, in the same manner that nickel is produced from its oxide, and also by heating the oxide in hydrogen. Winkler prepared pure cobalt by electrolizing a solution of cobalt ammonium sulphate using platinum electrodes and removing the occluded hydrogen by employing heat. Some chemically pure sheet cobalt procured by the writer from C. A. F. Kahlbaum's, Berlin, Germany, the well-known dealers in pure chemicals, resembled very closely sheet steel partly rusted. The color being due no doubt to the red tinge attributed to cobalt.

PROPERTIES AND USES.

Cobalt is described as a silver-white metal with a slight reddish tinge being somewhat harder than nickel; has a granular fracture and a specific gravity of 8.7 to 8.9. It is unalterable in the air, being only slightly tarnished in a moist atmosphere. It is malleable at a red heat and readily burns in oxygen. It becomes fusible in an ordinary furnace and takes up carbon. Nitric acid acts on it readily while sulphuric and hydrochloric acid dissolve it slowly with the evolution of hydrogen. Its melting point is about the same as that of iron. Cobalt is attracted by the magnet and it may be made slightly magnetic. Chemically as well as physically it resembles nickel, forming like nickel two series of compounds—the cobaltus and cobaltic—the cobaltus salts being the most stable. Most cobalt salts are pink, especially when hydrated, while the salts of nickel are green. This is the distinguishing feature between the two elements.

The compounds of cobalt are very valuable in the arts on account of the brilliancy and durability of their color. The use of commercial cobalt oxide for coloring glass was introduced by Scheurer in 1540, and up to that time no industrial use had been found for the compounds of cobalt. Smalte is the blue product formed by combining cobaltus silicate and potassium silicate with quartz and potassium carbonate when a blue glass is formed. This glass, ground to a fine powder, finds a wide industrial use in coloring glass, porcelain, enamel and pottery glaze. Another use is in coloring encaustic tiles, fresco painting and by paper makers as a blue pigment for staining writing paper. It has also been used for laundry purposes to correct the yellow stain of washed linen. Smalte has a great resemblance to ultramarine, but is not bleached by acids.

Alloys of cobalt and other metals are seldom employed industrially. Elwood Haynes has alloyed cobalt and chromium and produced a very suitable metal for cutlery. This alloy, known as "stellite," is patented and is used for blades for pocket knives. The blades will take a fine cutting edge and are guaranteed not to rust. They will remain bright after cutting all kinds of fruit. This is the latest and most interesting application of cobalt. Alloys of cobalt and copper and other metals have been produced, but as far as known they have no particular industrial use. Edison has produced thin cobalt sheets by electro-deposition on a copper-plate employing an intermediate coating of zinc. When the desired deposit of cobalt is produced the copper-plate is immersed in a weak hydrochloric acid solution. The acid attacks the zinc setting free hydrogen gas and forcing off the cobalt deposit.

ELECTRO-DEPOSITION.

Patents for the electro-deposition of cobalt have been noticed as far back as 1870; the first probably being that granted to Nagel in England in that year. It will thus be seen that the process is nearly as old as nickel plating; the latter being patented in 1869. In 1878 Glaser, another Englishman, also obtained a patent on a solution for cobalt plating. If cobalt should ever be produced as cheap as nickel, it could, for all practical purposes, be used instead of nickel. The scarcity of its ores and its present high price forbids its use to any great extent, even in cases where it would give better service than nickel. The price of cobalt suitable for anodes or salts is about $5 per pound in this country. It should be had considerably cheaper when purchased to the amount of twenty or thirty pounds. In England cobalt anodes are sold at four shillings per pound, which is equivalent to about $1 in United States money. As far as known chemical houses in this country do not make a specialty of handling cobalt anodes, but sheet cobalt chemically pure may be purchased for this purpose. The double sulphate of cobalt

and ammonium, which is the compound most suitable for plating is sold for about $1.75 per pound in small quantities. It should be had considerably cheaper in large quantities.

As far as the writer has been able to ascertain cobalt plating is not carried on commercially. The process has been treated to some extent in the text books on electroplating; a description of it is given by Langbein, McMillan and Watt. The most ambitious account is in Watt's Electro-plating, page 465 of the revised edition by Phillips. All the statements of Watt are not dependable for he states that deposited cobalt is whiter and softer than nickel-plate, while all authorities of note agree that exactly the opposite is the truth. Both Langbein and McMillan state that it is somewhat harder and not as white as nickel-plate. After many trials the writer has not been able to produce a deposit of cobalt that was whiter than nickel and the deposit seemed a little harder, possibly requiring a little more attention in buffing to a good color. Another statement made by Watt is that while cobalt salts cost more less may be used in the solution, thus rendering the process about as cheap as nickeling. When we consider the difference in the price of cobalt and nickel, and the fact that for a certain amount of current passing through the solution a definite amount of metal is deposited, it will be seen that cobalt plating cannot compare with nickeling in the matter of economy.

The double sulphate of cobalt and ammonium is the compound best adapted for cobalt deposition. The solution gives uniform results and is as easily managed as the ordinary nickel bath. The chloride of cobalt is recommended by some writers, but this chemical is more expensive and it is doubtful if the results are as good. The solution is made up as follows:

Double sulphate of cobalt and ammonium	4 to 6 ounces.
Boracic acid	1 ounce.
Water	1 gallon.

The double salts should be dissolved separately in boiling water, about one-third of the water being used for dissolving the boracic acid. As in the case of nickel solutions, boracic acid produces a brighter and tougher deposit. The anodes should be of pure rolled cobalt, and suspended from copper hooks. For ordinary work attached to wires the voltage should be about two volts, the same as in nickel plating. The anodes will gradually wear away and feed the solution in the proper manner. Deposited cobalt produced in this solution is just a shade darker than nickel, this being hardly noticeable after buffing. When the solution is properly managed and not too concentrated the red tinge attributed to metallic cobalt is not in the least apparent in the deposit.

Langbein recommends a cobalt deposit for facing copper plates for printing on account of its greater solubility in sulphuric acid. When such plates become damaged or the deposit is partly worn away through long usage, it may be entirely removed in a weak sulphuric acid solution and another deposit of cobalt applied. McMillan states that cobalt possesses a higher resistance to organic acids which might adapt it for the internal coating of copper or other cooking vessels. It is stated by a practical plater that a cobalt deposit makes an excellent base for steel articles that are to be enameled. He also states that it is superior to nickel for this purpose but its present high price forbids its use. Most alloys are considered harder than pure metals and it has been found that a solution composed of about two thirds nickel and one third cobalt yields a very hard deposit. As the deposit is harder than cobalt alone it may be useful for coating electrotypes, so that large number of impressions could be obtained. Its non-corrosive qualities would make it superior to iron, which is frequently used for this purpose. In conclusion it may be stated that nickel resembles cobalt so closely in its ordinary physical properties, such as color, hardness and non-corrosive qualities, that there should be little use for cobalt for ordinary plating. Its chief interest to the plater lies in the fact that it could be used in the place of nickel if it should ever be produced as cheap as nickel. At the present time there are no extensive deposits of cobalt known to exist, and the possibility of it replacing nickel is very remote. Further investigation, however, may adapt cobalt plating for some special lines of work.

HISTORY AND EVOLUTION OF THE BRONZING INDUSTRY IN FRANCE

By L. G. Delamothe.*

Up to the year 1828 only one color of bronze was known to the trade, and this was verde antique of different shades, according to the taste of the customer. In this year the Florentine bronze of "Bronze Lafleur" (named after the artist) began to appear, and a few job shops were established to do bronzing for the trade. This was the beginning of the development of the art of bronzing. After the Florentine Bronze came the Florentine fremé, or smoked, Florentine bronze, M. Camus being the first to produce it in 1833. Next came the "verde artistique," a kind of pale green, relieved on the high lights with yellow bronze powder. This was followed by the "bronze medaille," or medal bronze. M. Masselotte was the best artist of this period and was renowned for his peculiar and artistic finishes. Later on appeared the "bronze fer," or iron bronze, and still later M. Lemoine introduced his smoked bronzes which are even today recognized as some of the best finishes known to the art. This work was produced on only very expensive bronzes. M. Crosatier introduced a kind of smoked bronze on statues made from zinc composition. Messrs. Cresson and Barye were also bronzers of note. M. Barbedienne was the originator of a color of bronze, bearing his name, and in extensive use today. This bronze is the most simple to produce, and is best adapted for statues of larger size.

From 1870 up to the present time a series of painted bronzes have made their appearance. They vary in color and style according to the style of figures and the taste of the artist. These finishes are produced by mixing fine colors, ground in poppy oil mixed with bronze powders, and a special kind of varnish known as French mission. The figures are first brass plated; then oxidized with a solution of oxide of iron and graphite. When the figures are dry, the base, the draperies and sometimes the hair are painted dark and the flesh a lighter color. In some figures five or six coats are necessary to produce the desired tone. After each coat they are rubbed down with water and rotten stone like a piece of furniture, and when finished they have the appearance of a solid piece of bronze, owing to the bronze powder incorporated in the pigments. The coating is perfect when it is impossible to scratch the finish with the thumb nail.

*Inventor of Delamothe process for metallizing non-metallic substances, Santa Rosa, Cal.

BRONZE AND BRASS.

The Institute of Metals, London, are proposing to limit the use of the term "bronze" to copper-tin alloys.

ON THE BEHAVIOR OF CERTAIN ALLOYS WHEN HEATED IN VACUO*

By Professor Thomas Turner (University of Birmingham, England).

(Concluded from February.)

III—CRUCIBLE EXPERIMENTS.

An experiment was now conducted on a somewhat larger scale, in order to test the rate of volatilization *in vacuo*. For this purpose 180 grammes of 70 : 30 brass, of good quality, were melted in a clay crucible in a coke fire. About 30 grammes were poured into a small mold to obtain a check sample. The residue, weighing about 150 grammes, was quickly placed in a covered glass desiccator, and a vacuum at once obtained by means of a Fleuss pump. To prevent fracture of the glass, the inside of the desiccator was properly lagged by means of two layers of asbestos cloth, and an intermediate layer of crushed firebrick. The crucible was also covered with a firebrick to prevent radiation. By surrounding the crucible in this way, a red-hot crucible, containing over a quarter of a pound of molten brass, can be kept in a glass vessel for a considerable period without the containing vessel becoming appreciably warm.

The original metal contained as nearly as possible 30 per cent. zinc. When remelted, the sample cast in the mold contained 70.80 per cent. of copper. The loss of zinc in remelting in an open crucible was therefore about 0.8 per cent. The molten metal was placed in the deisccator, and, after being allowed to remain *in vacuo* for seven minutes, was removed and analyzed, and found to contain 73.94 per cent. of copper, showing a loss of 3.14 per cent. of zinc. As the metal was quite solid and only dark-hot at the end of seven minutes, it was probably fluid not more than three minutes, in which case the loss of zinc would be at the rate of 1 per cent. per minute. In other words, if by internal heating or other suitable means a charge were kept fluid during the whole period, complete volatilization of zinc might be expected to take place in less than an hour. Metallic zinc, weighing 4.9 grammes, was actually scraped off the under side of the firebrick cover. A repetition of the experiments with different weights of metal gave almost identical results.

These experiments show that considerable refining of impure copper could be accomplished by melting the metal *in vacuo*, as zinc, lead, arsenic, some tin, and probably other metals could be volatilized and recovered. There does not appear to be any good reason why such a process should not be experimentally tried on a fairly considerable scale. In these days of electric melting furnaces, and efficient air-pumping machinery, it should not be difficult to design a form of apparatus which would be suitable for treating impure residues and crude coppers. There might perhaps be introduced a process in two stages, in the first of which crude molten metal would be purified by being maintained for a time in an exhausted vessel, while in the second stage the partially purified copper could be refined in an oxidizing atmosphere to remove the remaining iron, tin and other non-volatile metals.

IV—THE REFINING OF HARD ZINC IN VACUO.

Zinc distils readily *in vacuo;* the temperature required is much lower than in air, and the losses are so much diminished that it is probable means will be devised in future for considerable applications of vacuum distillation in connection with the zinc industry.

The material known as "hard zinc" is produced in the ordinary process of producing galvanized iron. The bath of molten zinc which is employed, and in which iron is being constantly dipped, gradually takes up iron until it contains about 5 per cent. of the latter metal. The iron-zinc alloy is then unsuitable for further use in galvanizing, and is sold to the metal refiner or zinc works to be redistilled. This alloy appears to be specially suitable for refining under reduced pressure.

A sample of hard zinc analyzed in my laboratory by Mr. Groves contained:

	Per Cent.
Zinc (by difference)	94.48
Iron	4.71
Lead	0.81
	100.0

There was also present a trace of arsenic; but tin, copper, cadmium, antimony and bismuth, though tested for, were not in sufficient quantity to be detected.

This hard zinc was tested by heating 1 gramme *in vacuo* for varying times at different temperatures. In all cases the pressure in the evacuated porcelain tube was less than 1 millimeter of mercury. The results of the tests are given in the following table:

Heating of Hard Zinc in Vacuo. Analyses by Mr. Groves.

Temperature, Degrees Centigrade.	Time, Min.	Iron in Residue per cent.	Iron Volatilized per cent.	Zinc in Residue, per cent.	Lead in Residue, per cent.
1000	15	2.08	2.63	Nil	Nil
600	30	2.32	2.39	Nil	Nil
550	30	3.42	1.29	Nil	Nil
500	45	4.70	Nil	0.40	Nil
500	45	4.80	Nil	1.52	0.30

In the second experiment at 500 degs. C., the furnace was heated more quickly up to the required temperature, and the metal was therefore exposed to the heat for a rather shorter period than in the first case. Doubtless this accounts for the higher residue of lead and zinc noted in the second test.

These experiments show that at high temperatures the greater part of the iron is carried over with the zinc when hard zinc is distilled *in vacuo*. At a temperature of 500 degs. C., however, the whole of the iron is left in the form of a non-volatile residue, while zinc is obtained in the metallic state. If this process of refining were adopted on the large scale, there is no doubt that the consumption of fuel would be much diminished, while there should be no loss of zinc, as there is no possibility of oxidation. The necessary temperature is only just sufficient to render the metal visible in the dark, or, in other words, it is a scarcely-visible dull red heat, so that in all probability unlined iron vessels might be employed for the distillation. The labor costs should be small, and when the apparatus was once in working order the great reduction in fuel consumption and in loss of zinc should render its working remunerative.

V—THE EQUILIBRIUM OF THE COPPER-ZINC SERIES.

Hitherto experiments in the equilibrium of the copper-zinc series have been conducted at constant pressure, and the published diagrams are of this character. The experiments already described indicate that the conditions of equilibrium must vary greatly with changes of pressure, and open up a wide field of inquiry as to the effect of differences in the composition of the alloys and the variations in the pressure of zinc vapor. Particulars of a few preliminary observations in this direction may not be without interest.

In order to ascertain the approximate temperature at which zinc vapor begins to be evolved *in vacuo* a hard glass tube was taken, and into this was introduced some of the metal or alloy to be tested. The tube was then

*Paper read at London meeting of the Institute of Metals, January 16-17, 1912.

evacuated, until the pressure was less than that of 1 millimeter of mercury, and the tube was afterwards sealed. It was then placed vertically in an air bath so arranged that the lower part of the tube, which contained the metal, could be heated to the desired temperature, while the upper part of the tube was out of the air bath and kept well below the melting point of zinc. The air bath was then gradually heated until a deposit of zinc could be seen on the cool part of the tube. Proceeding in this way, it was observed that a deposit of zinc was produced in a few moments when zinc was heated to 375 degs. C. With 60 : 40 brass, or "yellow metal," the deposit did not form with any rapidity until a temperature of 520 degs. was reached, while with 70 : 30 brass a still higher temperature, of about 550 degs., was necessary. By a modification of the experiment a piece of pure (Mond) zinc and clean, pure (electrolytic) copper were introduced end to end in a horizontally placed evacuated tube, and then gradually heated in an air bath provided with a glass lid through which the progress of the experiment could be watched. The pieces of metal were arranged so as not to touch each other, and the whole of the tube was uniformly heated. It was observed that at a temperature of 380 degs. C. the copper rapidly assumed a yellow color. When thin sheet copper is acted upon, the brass coating is found to be quite firmly adherent and to stand polishing, or scratching with a knife, without change of color. The resulting sheet brass is very soft and ductile. By prolonging the heating for about two hours sufficient zinc is absorbed to cause the copper to become first yellow, then redder in color, and afterwards brilliantly white. It is therefore possible to prepare brass while the constituent metals are both in the solid state, through the absorption by the copper of the vapor emitted by the solid zinc. The action recalls to mind the ancient method of making brass, and the process of "sherrardizing" iron, the great difference being that the temperatures necessary *in vacuo* are so much lower, and there is no loss of zinc.

It will be seen, therefore, that at 375-380 degs. C. copper readily absorbs zinc vapor; at its melting point no zinc is retained; at 520 degs. zinc vapor is given off by 60 : 40 brass, while 70 : 30 brass gives off vapor of zinc at about 550 degs. With more careful experiment probably these temperatures will be lowered, for it is stated that at about 184 degs. C. faint indications can be obtained of the volatility of zinc *in vacuo* if the observation be extended over about fifty hours.*

Zinc vapor is quite colorless and transparent when in the hot evacuated glass tubes. Zinc can readily be distilled in glass vessels, and its close resemblance in appearance to the distillation of mercury makes the experiment very pleasing and interesting.

SUPPLEMENTARY NOTE.

It may be added that since the foregoing was in type an abstract has appeared in *Nature* (December 7, 1911) of a paper recently communicated to the Royal Society by Mr. A. J. Berry, who has obtained a definite compound $MgZn_2$ by heating together magnesium and zinc *in vacuo*. Heycock and Neville had previously produced a definite compound AuCd by heating gold with excess of cadmium in an evacuated hard glass tube to about the softening point of glass. The tube was bent over at one end, and this end was kept cool in order to condense the excess of cadmium.†

Tiede and Fisher have also quite recently effected a quantitative separation of lead from tin by heating *in vacuo* in a quartz tube in an electric furnace.‡

*E. Demarçay, Comptes Rendus, 1882, vol. xcv, p. 183.
†Journal of the Chemical Society, 1892, vol. lxi, p. 914.
‡Berichte, 1911, 2, p. 1712.

TINNING IRON.

By Charles H. Proctor.

To tin the inside of cast iron pots or kettles the following operations are required:

(1) The inside of the articles must be freed from sand and scale, which is preferably accomplished by using a solution of hydrofluoric acid and water in the proportion of from 10 to 20 parts acid to 80 or 90 parts water. The acid is allowed to act for thirty minutes or more, until the scale is removed. The acid should be replaced in a wooden barrel lined with asphaltum until required again or placed in another pot or kettle to be cleansed or, if desired, a tank can be arranged and the whole article may be immersed or as many as the tank will hold, so that the operations may be made continuous if required. After the pickling process, the articles are washed with clean water; then rinsed with water, containing two or three ounces of sodium carbonate to each gallon of water, which neutralizes the acid and will prevent rusting or oxidizing. The surface should now be scoured with common sea sand, moistened with some of the soda water. The articles are now ready to be heated, which may be accomplished by any of the usual methods, such as a Bunsen flame, coal or coke fires or by the aid of a charcoal fire. It is necessary to heat the articles up to 450 to 500 degs. so that when the tin is applied it will not congeal too rapidly by chilling.

(2) The next operation is to apply the flux, which consists of saturated solution of chloride of zinc. This may be purchased from chemical houses or may be prepared by dissolving scrap zinc in muriatic acid until no more will be absorbed. This operation usually takes from ten to twelve hours, and the addition of the zinc must be made at intervals to avoid too great an evolution of hydrogen gas. When the articles to be coated with tin have reached a temperature of 200 degs. they should be swabbed over with the chloride of zinc and this operation should be repeated again just before the tin is applied.

(3) The tin, which should consist of the best Straits tin or an equal grade, is melted in an iron kettle of sufficient size so that if the operations are to be made continuous, on a commercial basis, time will not be lost in maintaining the proper temperature. The metal should be maintained at 500 degs. The tin should be sprinkled over the surface with a little sal ammoniac to remove the dross. Everything should now be ready for the tinning. When the articles are sufficiently heated, sprinkle a little dry sal ammoniac inside of the kettles and apply the molten tin with an iron ladle of sufficient size. Turn the kettles in all directions so that the inside becomes completely covered then remove the excess of tin as quickly as possible. Now take plumbers' tow (this is used in making rope) so that the hands will not be burnt by coming in contact with the pot, place a little beef tallow in the pot and go over the surface with the tow. This acts as a flux and gives a smooth and bright appearance to the tin. If the kettles are of a small size, they can be cooled in a tank of kerosene oil, maintained for the purpose; then dried out by the aid of maple sawdust. For successful results the operations must be accomplished quickly. The tin used in the kettle will gradually form dross or oxide of tin which will appear in lumps and settle to the bottom. These lumps can either be removed and reduced to tin or the whole kettle of tin can be stirred with a green stick of wood.

Note.—Hydrofluoric acid must not be placed in the regular acid crocks. Wooden or lead lined tanks must be used to contain it.

THE MANUFACTURE OF WROUGHT BRASS

A Description of Modern Methods for the Production of Plate, Sheet, Rod, Wire and Tube.

By L. J. Krom.

(Continued from January, 1912.)

ANNEALING.

After the rods are scalped or overhauled they are "sprung," which consists of bending them in a curve, which is claimed, prevents them from cracking in the muffle. The next operation is to put them in a muffle furnace, such as shown in Fig. 33, and heated red hot. These furnaces are built of brick and lined with fire brick and are fired with gas, coal, oil or wood. Until a very few years ago wood was considered the only thing to use for annealing rod and wire bolts, but with the advent of new ideas, together with the inevitable shortage of wood it has been discovered that it was possible to anneal brass and other alloys with other forms of fuel as mentioned above. In annealing operations the precautions mentioned for the annealing of sheet applies to the bolts, from twenty minutes to one hour being required to heat them to a cherry red. Leaded metal must have a lower temperature than the non-leaded stock. No water can be applied to leaded stock until perfectly cold, while the other class of metal can be cooled suddenly. After annealing the bolts are pickled just as is the sheet metal. The bolts are immersed in a twelve to one solution of sulphuric acid and water for from fifteen minutes to one-half hour. The bolts are then rinsed off in cold running water and are ready for rolling.

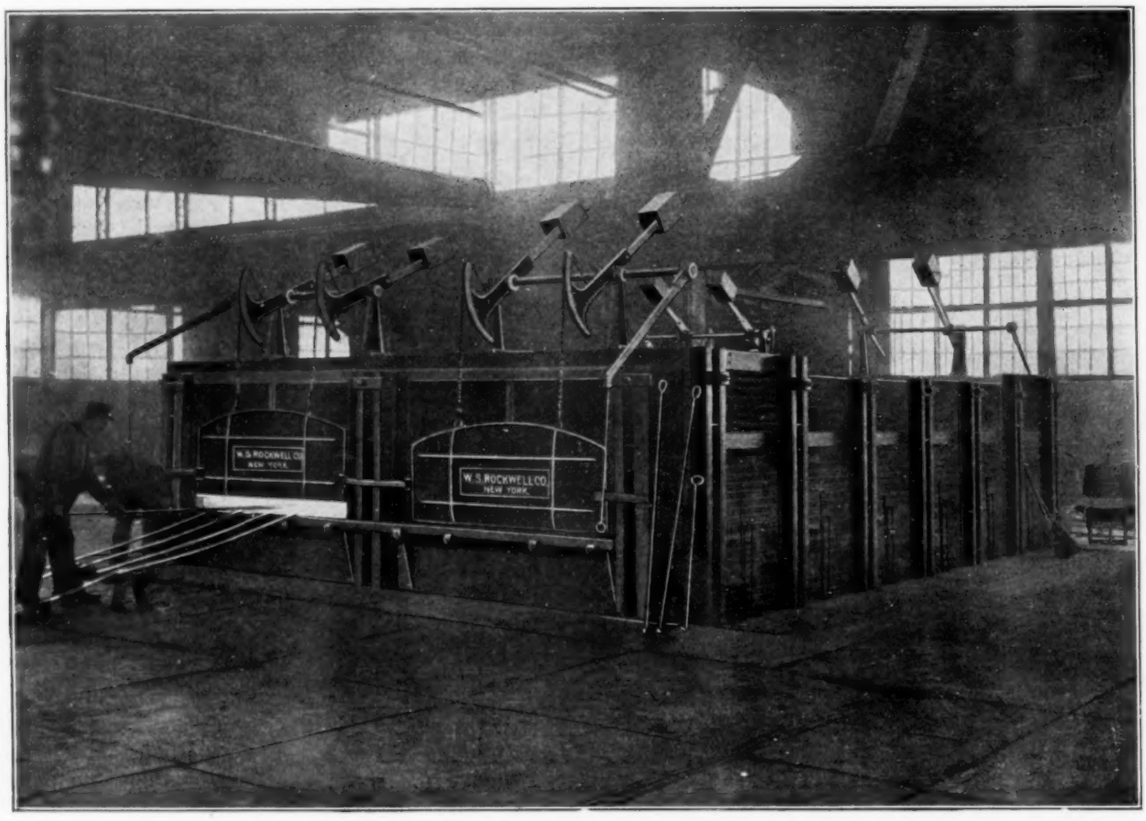


FIG. 33. ROCKWELL TWIN-CHAMBER, DOUBLE-END, UNDERFIRED ANNEALING FURNACE—OIL FUEL. ATTACHING THE LONG HOOK FOR PULLING IN A CHARGE OF METAL.

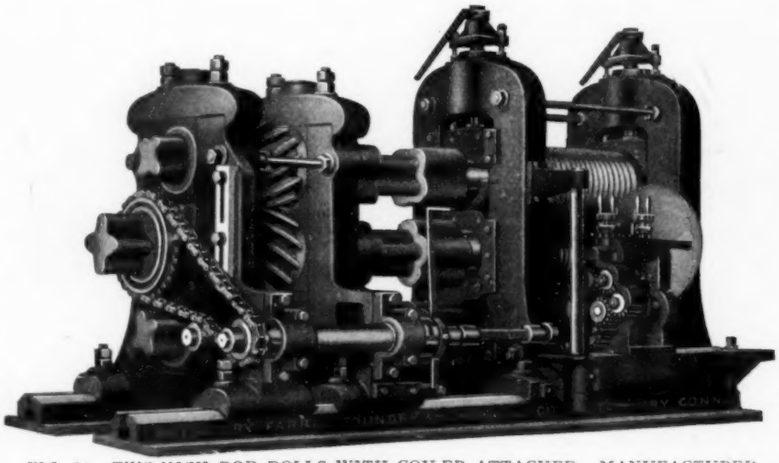


FIG. 34. TWO-HIGH ROD ROLLS WITH COILER ATTACHED. MANUFACTURED BY WATERBURY FARREL FOUNDRY AND MACHINE COMPANY, WATERBURY, CONN.

ROLLING THE BOLTS.

The bolts are rolled between chilled iron rolls having grooves across their faces, which accommodate the various reductions made in the diameter of the bolt as it goes through the rolls.

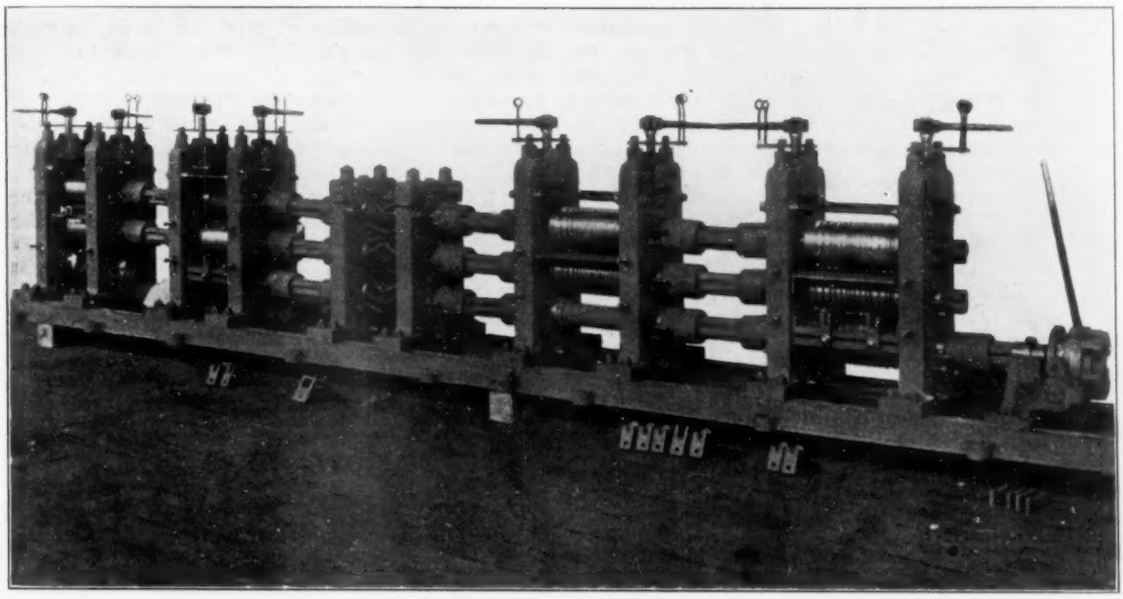


FIG. 35. TRAIN OF MOTOR-DRIVEN, THREE-HIGH ROD ROLLS, MANUFACTURED BY FARREL FOUNDRY AND MACHINE COMPANY, ANSONIA, CONN.

The grooves in the face of the rolls generally start with a diameter slightly smaller than that of the rod or bolt and diminish by variations of from 1/8 to 3/8 of an inch to the last groove, which leaves the rod at 3/4 in. when it goes to the bull-block for further reductions. There are, of course, several annealings and picklings necessary between the various passes through the rolls.

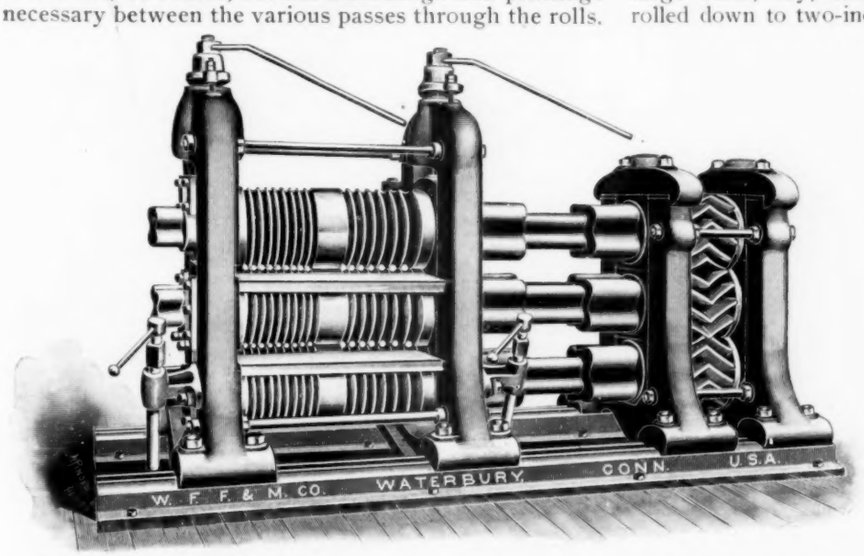


FIG. 36. THREE-HIGH ROD ROLLS GEAR DRIVEN. WATERBURY FARREL FOUNDRY AND MACHINE COMPANY, WATERBURY, CONN.

Just when and at what reduction these occur depends on the composition of the metal and the practice of the mill. The effects of the rolling operation on the rod material is most beneficial. The outside shell of mitted to the center, until finally the whole fabric, as it were, is worked over as though churned. It is a familiar adage in rolling mill practice that "the more metal is worked the better." This is well carried out in the rolling operation on a bolt of metal intended for the rod is worked on first, the movement being transwire. All of the rolling and subsequent drawing operations on rod and wire are done in the cold for the usual mixtures found in ordinary practice. Some special mixtures like Tobin bronze or naval rod are cast in large sizes, say, six or eight-in. square billets and rolled down to two-inches or so, hot and the subsequent operations are done in the cold.

Several types of rolls are shown in Figs. 34, 35 and 36. It will be noted that the machine shown in Fig. 34 consists of two rolls in a frame, while those in Figs. 35 and 36 have three rolls set in each housing. The three high type of roll has a decided advantage over the two high type for continuous work. The lowest roll revolves in an opposite direction to the topmost one and consequently the bolt can be put through the bottom and middle roll and returned to the roller through the top and middle roll and given a reduction on the return. The rolls shown in Fig. 35 are motor driven, while those in Fig. 36 are gear driven. Fig. 34 shows a set of rolls equipped with an automatic coiler for coiling the rods as they are rolled and putting them in convenient shape for reannealing and pickling for the next operation.

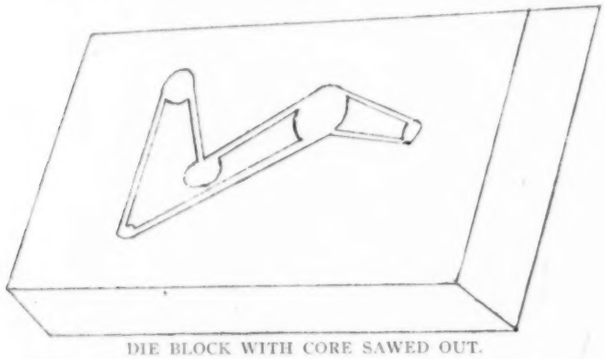
(To be continued.)

BLANKING DIES

By Easy Way.

Plain blanking dies produce from sheet metal stock any flat shape required. The shape will have the exact outline of the model templet. This templet should be made from a piece of sheet metal filed and finished on its edges the exact shape and size the die is intended to have; then if these correspond after hardening the die, the product will be of exactly the same shape as the model templet. Some die makers produce the punch first, while others work out the die. These conditions are all governed by the shape required, and in many cases are permissible. The die block is the first to be operated on, and in order to lay it out we must produce a bright, smooth surface, and use blue stone and water for coloring it. Some die-makers blue the steel by heat after polishing the surface. By using the blue stone solution the surface will be coppered nicely and all the templet lines can be produced by a sharp scratch awl and plainly seen, which does not necessitate one waiting for the steel block to heat and cool.

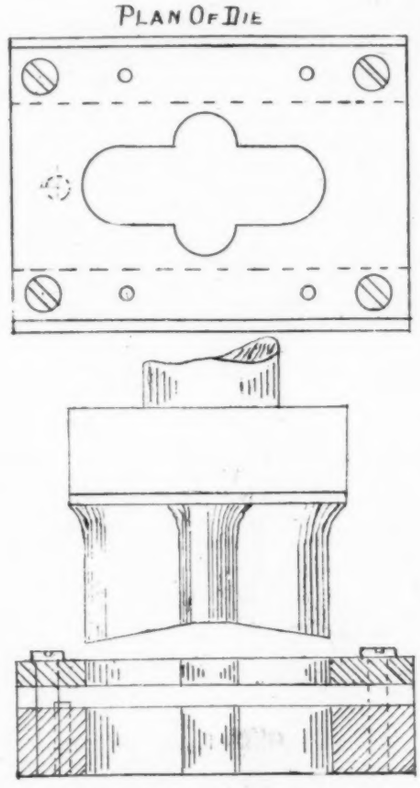
Many die makers possess suitable grip hooks or clamps for holding the templet on the steel while marking around it, but they are not absolutely required. One can find numerous other ways of doing the same thing handily, by a screw press, drill press, or the faceplate on an engine lathe with the steel and templet held in position by the tail stock spindle. Then after the desired shape is outlined on the steel, we must determine the best and quickest way to remove the stock from within the outline. A most satisfactory method is by using short pieces of drill rod of the same sizes as the drills to be used. These



DIE BLOCK WITH CORE SAWED OUT.

rods are made into ring center punches and hardened, then a light tap with a hammer will produce a center for starting the drill and indicate a circle at the same time. By this method all laying off and spacing with dividers is eliminated with very gratifying results. After this the die block is drilled, then reamed from the back with a taper reamer suitable to the draught required. Then with a thin, flat drift, the walls between the holes are cut and the pieces drop out, and oftentimes milled or shaped out, as the case may be. However, should it be impossibble to use a machine, hand work must be resorted to, and the necessary files by the aid of a bevel or die square with the proper degree of taper are used to produce the templet's contour. This must be fitted in the die block until just flush with the top edge; then if the inner walls are smooth with a taper comparing with the bevel or die square, and no space around the templet, commonly called "light houses," or leaks; a die has been produced that will supply the exact shape intended.

If the punch, sometimes called the "upper die," be produced first, plane the steel, after which the templet can be soldered fast to the face of the steel and then cut, file and finished to it. Generally, when the die is produced first, hardened and tempered, the punch is worked very near the shape, and then with a force press squeezed into the die 1/16 in. for impression, and (vice versa) with a die and a hardened punch. However, care must be taken that the cutting edge of the die is not cracked or broken when the punch is drawn from the forced fit. After this the punch and die are relieved by filing and stoning, that they may enter each other without unnecessary friction. Then the gauge pin or stop and the stripper, which is generally worked out at the same time as the die are assembled and an actual trial is ready in the punch press, which will determine the efficiency of the die. Traveling die makers in



A PLAIN BLANKING PUNCH AND DIE.

making their rounds from shop to shop come across some very peculiar methods in the handling of tools and tool stock. As an example, the steels to be used are tumbled into barrels or like conditions, and not arranged on shelves or assorted as to their grade by marking. Then when a piece of stock is wanted for a die the nature of the steel is not known, nor can this information be obtained readily. Even the overseer himself must ask himself questions and cannot explain with an intelligent answer without a question mark attached. Under these conditions the die maker's judgment and skill is required to enable him to make good in the eyes of the overseer. For an overseer who is responsible for such disorder is generally the hardest man to work for, and it is almost impossible to suit him. When the die is finished and ready for hardening is the time that strategy must be resorted to and prevent the loss of an earnest endeavor by the improper hardening of the unknown steel

properly. To avoid this mishap, the following will become useful to many at the opportune moment. While the steel is heating slowly, prepare a solution of two handfuls of salt, one ounce of corrosive sublimate and about six quarts of water; then, when the steel is red hot, plunge it into the bath. This solution is poison, but satisfactory results have been obtained by it.

In many die shops improved methods are in vogue that materially assist the workmen and encourages them to do more and better work, and the employer always benefits from these improvements. It is far better after a mechanic has worked hard all day to be able to see something that has been accomplished from his efforts, and on leaving for the evening is not ashamed to look the boss in the face, but feels elevated and proud that he has produced good returns for his wages. Or, in other words, he is figuratively "walking on velvet," and anxious to return to his task on the following morning, feeling buoyant and strenuous for another day's toil. The writer has experienced conditions like these where, if the employees are encouraged by an incentive plan they will continue day after day to produce voluntarily with profitable results both to themselves and their employer.

The sketch showing a die block with the core sawed out is a good example for encouragement, as with this only a few holes are drilled, and the rest of the stock within the templets outline is sawed out by a die-power saw. This eliminates a workman devoting unnecessary time at the drill press, and whenever the saw can be used to remove the core it will be found a wonderful time saver. The draft or clearance of the die is included in the operation, and disposes of the cutting-out with a flat drift, and also reduces the amount of machining or filing. In the best shops these machines are in use and are appreciated by all concerned. A filing machine is also very encouraging to the mechanic, as it assists in eliminating hand work with the file, which is very tedious.

(To be continued.)

SILVER ANODES*

Some Facts Dealing with Their Purity as a Requisite for Successful Working.

By J. L. R. Brown.†

It seems to me that the best way to endeavor to show that "purity" is a requisite in a silver anode is to point out some of the bad results arising from the use of impure silver, all of which bad results might have been avoided by the use of silver prepared for the purpose of plating and fully guaranteed. I am sure you have all (especially in the old days) had the disagreeable experience of contending with the presence, on your silver anode surfaces, of a black film attached so lightly that unless carefully handled it would float off into the solution, but which no amount of work on your part, such as altering resistances, changing solution conditions or the many things one will do on occasions of this sort, could prevent. You could only carefully remove them, wash thoroughly and replace, and continue this operation until the anodes were consumed. Not all of the anodes would work this way, and sometimes not all of the surface of the anode would turn black. It would form in streaks alternating with clear portions, and under these conditions, the free cyanide would act correctly on parts of the surface and very little, if at all, on others; at times eating through the anodes in the clean portions causing the black, where surrounded by the clean, to become detached and sink to the bottom of the tank. The ideal way for an anode to go into solution is, of course, to dissolve evenly all over the surface and to disappear from the edges, preserving the contour in the form of a regular curve.

The appearance of the silver anode before using is no guide in determining whether the anode will work white or not, as the surface of an anode which will work black is as clean and white before going into the solution as any other which is perfectly pure. In fact, there is little doubt but that the silver entering into a black anode is .999 fine, which it is necessary for it to be in order that it may be sold as "commercial silver." The term .999 fine, however, simply means that in every thousand ounces of bullion you purchase, there are nine hundred and ninety-nine ounces of pure silver and one ounce of alloy. When this ounce of alloy is all, or partly, composed of insoluble matter, the action of the free cyanide in the solution, dissolves out the silver in the anode, and leaves the insoluble matter in the shape of a black film on the surface. This will accumulate so rapidly when the anode is bad as to necessitate removal and cleaning as often as once a day. I realize that silver anodes will turn black when the silver from which the anode was made is absolutely all right. This may arise from a number of conditions, such as the action of sulphur in a bright solution, too dense current for the work to be plated, or too much or a poor quality of cyanide. When the discoloration arises from faulty conditions in the plating room, it is of a different shade and easily distinguished, and a good plater can easily discover the cause and apply the remedy. The only remedy I ever heard for a black anode where the silver was bad, was to replace the bad ones with good ones.

Among the bad results arising from the use of impure silver may be mentioned the following: The increasing amount of resistance caused by this film lessens the rate of silver deposition and in the absence of scales at your tubs you give the customer a lighter plate than you intend to, or else, if you are careful to get the weight of silver on the goods, it takes you so much longer to do so that the output of your department is much lowered. Another thing, the presence of this film retards the dissolving action of the free cyanide in your solution, and in a slight degree the anode becomes neutral and you plate the silver out of your solution at a greater rate than the free cyanide can replace it. I believe the first impulse of a plater, under this condition, is to increase the amount of free cyanide so as to take up the silver faster. This, however, is only a palliative and accomplishes no lasting good, as your solution is soon out of balance, and requires refining, and replacing by a new one. One member of this Association has told me of his solutions, which have been in use nearly five years, and the quality of the anodes has been so uniformly good that in all that time he has not been obliged to supply any silver salts.

When the periodic cleaning of the black anode is neglected, the film becomes thick and floats off into the solution and not only contaminates it, but the dirt is carried over on the work. This makes it necessary to remove the goods and clean them with the danger of getting grease on the surface, and interfering with the smoothness of the plate. If the dirt gets on the goods and is not noticed, it is plated over and the plate blisters and tears out in burnishing or buffing, and requires stripping, refinishing and replating. That is what happens when you do not remove the anodes and clean them. Now if you take them out, the action through the solution in lifting them

*An address delivered at the banquet of the National Electroplaters, February 10, 1912.

†Assistant manager, Handy & Harmon, Bridgeport, Conn.

rinses the dirt off into the bath, and you get it anyway.

In the old days, when it was necessary to use any kind of silver which could be obtained, I understand it was the practice of some platers to hang a cloth curtain in front of the anodes to keep the dirt from floating over to the work; and while it would accomplish this purpose, it was still necessary to wash the anodes, and in addition the curtains needed washing, and the removal of the anodes and the curtains agitated the solution, and rinsed off the dirt. As you can see, these troubles would not have arisen had the entire anode been soluble in the solution, as all of this residue must have been present in the anode when it was put in your solution, and the action of the cyanide solution, taking out the pure silver in the plate, left the black residue, because the cyanide was not a solvent of it. We had customers who bought the regular thousand ounce commercial bars, brought them to a low heat in a forge fire, put them under a drop hammer and flattened them to a point where they would enter their rolls and others who melted these bars, pouring the silver into flat shallow moulds thin enough to enter their rolls, and from this point, with suitable annealing, rolled them to the right gauge and width, and cut to suitable lengths for anodes. We had other customers who bought what are known as Government Assay Bars, which are cast in a mould turning out a bar thin enough to be rolled without remelting. These customers used these bars feeling confident that silver bearing the stamp of the United States was the very best which could be obtained.

As a matter of fact, the government stamp on a bar of silver simply means that the melt from which that bar was poured was assayed and the fineness stamped on the bar is the result of such assaying. These bars may or may not contain insoluble matter, and are therefore, we think, not the best silver for the purpose. The point of view of the mints and the assay office is entirely a different one from our own. Our object is to establish a standard for anode silver and to uniformly maintain that quality; while the government in refining the silver simply uses it as a carrier for the gold.

The proportion of silver in the doré which the government requires in the process of gold refining used by them is so high that the immense amount of gold turned out requires a far greater quantity of silver, and this silver is furnished the government absolutely free, and they are paid to use it. You take in gold and silver bars to be refined, they return you the silver which they do not want, pay you for the gold which they do want and charge you for the refining. You can readily see the only interest the government has in the silver is to use it as an aid to their gold refining and to so carefully part the bars as to leave the silver free from the gold and be able to turn it out .999 fine.

There are two branches of industry using silver which should have the purest which can be obtained to get the best results, one the electro-platers, and the other the manufacturers of silver nitrate; and while at present the electro-platers use the larger amount, the recent popularity of the moving picture show, the almost universal use of the picture post card (I speak of the sensitized kind), and the coming among us in such large numbers of the amateur photographer, the consumption of silver in the manufacture of nitrate is much larger than is generally known.

Notwithstanding the fact that silver plating was being done commercially over sixty years ago, there was no concern manufacturing and marketing silver anodes as a commercial trade article until we originated the idea, and, so far as I know, made the first silver anodes for sale as such at our plant, which was then located in Chicago. In talking with a plater, who at the time was engaged in washing off his anodes and skimming his solution, we asked if it would not be a good thing if an anode could be made which would always work clean and white and guaranteed by the manufacturer to be uniform from lot to lot. From the encouragement received at this time, we commenced experimenting and after numberless discouragements and expensive experiments, we succeeded in 1903 after we had moved our plant to Bridgeport, Conn. Since then we have made and sold tons of anodes, every ounce of which we could thoroughly guarantee.

THE FRENCH GREY FINISH.

By Charles H. Proctor.

A method of producing a good French gray without the use of silver for novelty work comes into my mind and is as follows: First, prepare an acid copper bath consisting of

Sulphate of Copper	1¾	lbs.
Sulphuric Acid	2	ozs.
Common Alum	3	ozs.
Water	1	gal.

Use anodes of soft copper and a cold solution, first dissolving the salt by the aid of boiling water. Second, prepare a nickel bath as follows:

Double Nickel Salts	6	ozs.
Single Nickel Salts	3	ozs.
Water	1	gal.

Dissolve the salts by the aid of boiling water and when cool add all the common salt the solution will absorb. Use the regular nickel anode and a low current.

To produce the French gray, acid dip the articles and polish as usual, cleanse and copper plate in the acid bath. It is advisable, if you have a hot cyanide of copper bath in use, to give the articles a flash in the same previous to immersing in the acid bath, though it is not absolutely necessary. Plate in the acid copper bath for ten to fifteen minutes until a uniform dead copper surface is produced, afterwards remove, wash and dry. Now burnish or polish the high lights in the usual manner, leaving the background undisturbed. After polishing, cleanse as usual, then place in the special nickel bath, run for about five minutes with a low current to avoid over nickeling or burning. Remove the articles, wash and dry carefully. The result will be an excellent French gray with burnished relief. The articles can be lacquered as usual if necessary, but as nickel does not tarnish the same as silver this operation can be avoided.

When a cheaper product is required and yet have more antique effects than the above method, then it is advisable to nickel plate the articles and then silver plate them for a few minutes in the silver and arsenic bath. The nickel bath given can be used for the purpose. In the silver and arsenic bath I have not given any specific proportions, leaving that to the judgment of the operator. But the bath should not contain less than one and one-half ounces of silver to the gallon and six ounces of cyanide. For articles not made from brass or bronze the acid dip of course can be omitted, but the cyanide of copper deposit must be given previous to the acid copper deposit.

REMELTING GERMAN SILVER.

In remelting German silver scrap, 4 ounces of 30 per cent. manganese copper to the pot will be found beneficial.

THE METAL WORK OF A GIGANTIC WATER WORKS

A Description of the Bronze Work for Valves and Sluice Gates Used in the Catskill Water System For the New York City Water Supply.

By James Owen.*

The Catskill water system now under construction by the city of New York is the largest undertaking of its kind on record. To regulate and control the flow of water from the great reservoir in the Catskill mountains to the city, a large number of sluice gates and valves are required. These are of special and very substantial design and are being furnished under five contracts aggregating $620,000 in value. Bronze mountings, such as seats, guides, and stems form an important item in the construction of these gates and valves, and the bronze compositions were the subject of careful study by the engineers in charge of this work. At first, there were four classes of bronze castings employed, known as Class A, B, C, and D. Class A was the familiar 88-copper, 10-tin, 2-zinc "government bronze," tensile strength not less than 30,000 pounds per square inch. Class B was a somewhat similar mixture, but lower in copper (83 per cent.). These mixtures were used for valve plug guides, stuffing boxes, glands, nuts and similar parts. Their use has been abandoned however for manganese bronze, which is both cheaper and stronger, and can now be readily obtained. Class C and Class D metals were used for valve seat facings, the specifications for the mixtures being as follows:

Class C—Copper, 82.8 per cent.; tin, 4.8 per cent.; zinc, 4.4 per cent., and lead, 8 per cent. Class D—Copper, 82.7 per cent.; tin, 7.1 per cent.; zinc, 5.3 per cent., and lead, 4.9 per cent.

The facing on the valve plugs were of Class C metal, and those in the valve bodies of Class D metal. As these parts are in rubbing contact under heavy pressure without lubrication, a rubbing test was specified in accordance with the following specifications:

"A piece of Class C bronze at least 16 ins. long and 2 ins. wide, finished on one side, shall be firmly secured and a piece of Class D bronze 8 ins. long and 2 ins. wide, similarly finished, rubbed back and forth along its surface for at least 500 strokes at a speed of at least 35 feet per minute, the two metals being forced together with a pressure of not less than 1,000 pounds per square inch and the surface lubricated with water only. During this test neither metal shall be abraded or cut, nor shall there be any chattering or screaming."

The rubbing tests were successfully made on an ordinary planer, pressure being applied by means of a weighted lever arm. The seat facings for rectangular sluice gates are of the form shown in Fig. 1. One of the contractors proposed making them by the extrusion process instead of castings machined to size as originally intended. It was stated, however, that metals of Class C and Class D composition could not be successfully extruded on account of the excessive tin content. It was proposed to use a so-called "nickel bronze," having a composition of 58 per cent. copper, 40 per cent. zinc, 1.5 per cent. nickel, and 0.5 per cent. iron, in conjunction with a "Naval bronze," 63 per cent. copper, 36 per cent. zinc, 1 per cent. tin, and less than 0.2 per cent. lead. Investigation showed that it would be advantageous to use extruded metals of the above compositions, as all information available, confirmed by tests, indicated that they offered a higher corrosion resistance than bronzes, higher in copper and tin. Bronze manufactured by the extrusion process is also much denser, more homogeneous and fibrous in its structure due to the great pressure to which it is subjected during extrusion, and is more uniform in structure and less liable to hidden imperfections and blow holes than any cast material. While these qualities were all very desirable it was equally essential that the metals pass the rubbing tests. The results of such tests were very unsatisfactory however, the surfaces of the test pieces being badly abraded. The proposal to use extruded metal was therefore rejected and the parts were cast of Class C and Class D compositions as originally specified, and machined to size.

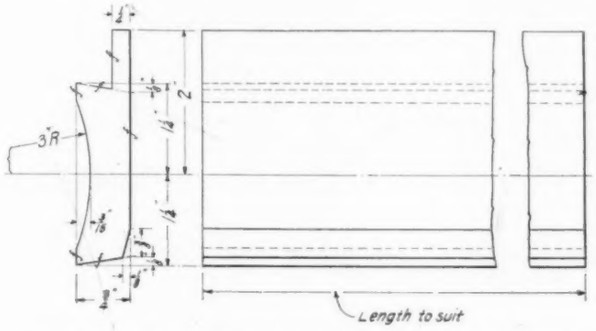


FIG. 1. SEAT FACINGS FOR RECTANGULAR SLUICE GATES.

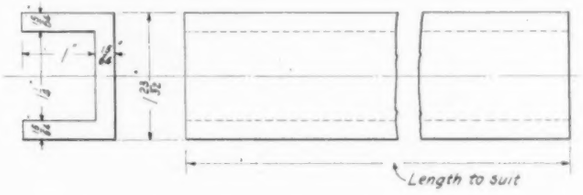


FIG. 2. VALVE PLUG AND SLUICE GATE GUIDES.

The valve plug and sluice gate guides are of channel form, as shown in Fig. 2, and these were made successfully of nickel bronze by the extrusion process and a material saving in machine work was thus effected. All bronze castings used on this work were required to be made of new metals, and any indication of imperfect mixing was deemed sufficient grounds for rejection. Some rather heavy manganese bronze operating stems were required, and the forging of a number of these was described in The Metal Industry of March, 1911, and the finished rods were shown in the October number. Manganese bronze, equal to Spares or Parsons bronze, was specified with a tensile strength of not less than 65,000 pounds per square inch, an elastic yield point of not less than 45 per cent. of the ultimate tensile strength and an elongation of not less than 25 per cent.

Satisfactory results were obtained in cast bronze

*Assistant Engineer, New York Board of Water Supply.

stems as well as in those that were forged. There is an increasing number of manufacturers who can produce a satisfactory manganese bronze at moderate cost, and the profound mystery which formerly surrounded it seems to be clearing up. The above specifications are moderate in their requirements and may be readily met with. The following is an example of more rigid specifications given out by a large construction company for some parts on a bridge erection traveler:

Tensile strength....	not less than	75,000 pounds per square inch
Elastic limit.....	" " "	35,000 " " " "
Elongation.....	" " "	25 per cent. in 2 inches.
Reduction of area...	" " "	25 per cent. at fracture.
Compression, elastic limit.....	" " "	25,000 pounds per square inch

Permanent set produced by a load of 100,000 pounds not exceeding 0.1 inch on a one inch cube. Metal capable of bending cold 120 degs. to a radius equal to its thickness.

BABBITT METAL

SOME IMPORTANT CONSIDERATIONS REGARDING ITS MANUFACTURE.

The manufacture of anti-friction metals offers a great many interesting problems which have to be solved before the way of the melter is smooth. Among some of these questions which have come to our notice are the following, which have been arranged in two propositions. These propositions have been propounded to us by one of our readers who is desirous of getting light on the subject. We have published Mr. Jesse L. Jones' reply at the close of each proposition.

PROPOSITION A.

A short time ago, a certain large railroad gave out specifications for their babbitt metal and in these specifications they required that the metal be cast in large pigs and that no segregation be shown. By lack of segregation, they meant that the metal must show a perfectly even and uniform fracture and grain. They claim that metal so furnished produced better bearing linings. Samples were submitted to them which did show a slight unevenness. This unevenness or so called segregation was due to the fact that in pouring the metal in large molds (not water cooled), it was so much longer in cooling when the molds became hot that the specific gravity of the constituent parts of the metal caused the lighter metals to commence rising gradually to the top. This separation was, of course, only slight, but it showed the metal a little coarser grained at the top of the pig where it cooled last than at the bottom. It was explained to the railroad that, as these pig bars had to again be remelted in their own kettles, it was there that attention should be paid to the segregation and not in the pig furnished; that by their melting and stirring the metal thoroughly, it would again become an even mixture and if they stirred it thoroughly before pouring it into their bearings, it would also produce evenly mixed bearing linings. It seems to us that the place to look out for the segregation is in the pot in which the metal is being melted just before it is poured into the bearings.

Mr. Jones says: "While you are correct in your contention that some segregation is unavoidable where babbitt is cast in large molds, not water cooled, it is also true that thorough alloying will reduce the amount of segregation and give an ingot of a finer grain even if the mold is large. For alloying a rather high heat should be used, but before pouring the babbitt should be cooled down considerably. When melting babbitt for pouring bearings, liquation will occur to some extent in the ingots as they melt down, and for this reason the temperature should be raised to about 850 degs. F., the metal well stirred and then the temperature lowered to the proper pouring temperature."

PROPOSITION B.

Another large manufacturing concern required a sample of babbitt and specified that virgin metal should be used and no scrap or junk. This raises a question as to the quality of pure lead, tin or antimony that is obtained from scrap or junk as compared with lead, tin or antimony furnished in the regular commercial form. Junk and scrap are supposed to consist of such stuff as old lead pipe, old type metals and dross obtained from factories where considerable babbitt, antimonial lead and type metals are used. So long as the lead, tin or antimony secured from this junk is pure, containing no iron, arsenic or other impurities, is not this lead, tin or antimony just as good in the matter of quality as when bought in the virgin commercial form?

As we understand it, the trouble with scrap, junk and dross products is that when it comes to using them for babbitt, zinc and a large percentage of copper and other impurities are allowed to get into the metal, but that the trouble is not due to any inferiority of the lead, tin or antimony in itself. They speak of weak bodied, burned out products. The more lead is refined or heated under a temperature of, say, 1200 degs., it occurs to us, the cleaner it gets. It is certainly subjected to a much higher heat when being extracted from the ore. Another point: Does burning tin, lead or antimony do anything more than reduce the quantity? Does it in any way affect the quality? We figure that the burnt part simply becomes an oxide, but that whatever tin, lead or antimony is left retains the same quality. We cannot see that melting lead over and over again in any way affects the quality of the lead.

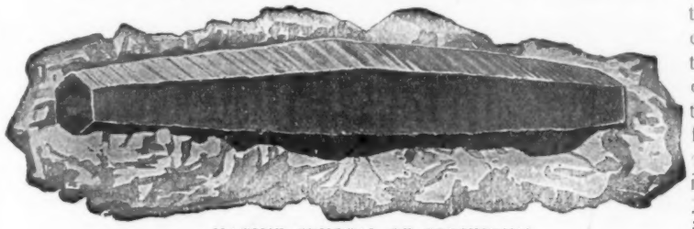
Mr. Jones says: "The quality of tin, lead, etc., is impaired by repeated overheating, as the metal becomes thick or sluggish, due to dissolved or mechanically entangled oxide. It is true that these metals are subjected to a much higher heat when being extracted from the ore, but this is in a reducing atmosphere, while in ordinary melting the metal has little or no protection from oxidation.

Freedom from oxides may in a great measure be judged by the fluidity of the metal. If white metal drosses (free from iron, aluminum, zinc and arsenic) are smelted in an adequate reducing furnace at about 2,500 degs. F., and the proper additions made to the resulting metal, babbitts can be produced that are superior to the same babbitts made from all virgin metal because the babbitts will be better alloyed than when virgin metal is used."

CORUNDUM

By Walter C. Gold.*

During the last decade there has been a marked increase in the use of Corundum for the manufacture of grinding wheels. This is solely due to the discovery of an immense deposit of Corundum ore at Combermere, Barry's Bay, Ontario, Canada. This deposit was accidentally found by a resident of that region, Mr. Armstrong, in the year 1900. The whole face of the mountain, which is twenty miles from a railroad station, is literally covered with Corundum and its associates. Although the deposit yields but 8 per cent. pure Corundum, it is so large (it is an immense "drift") that it pays to mine the mineral; besides, this is the only known deposit of any magnitude on this continent. There is some Corundum mined in India from which India Oil Stones have been manufactured; some in Australia and a little in Montana and Georgia, although the latter mines have been practically abandoned, the supply becoming exhausted. Years ago there was considerable Corundum mined at Hilltop, near Asheville, N. C., but these mines, too, were abandoned owing to the cost of the mining becoming too great. Some very fair grinding wheels were made years ago from this North Carolina and Georgia Corundum, which is usually found in a belt of serpentine in altered olivine rock; has gneiss for an immediate associate, and in the



NATIVE CRYSTAL OF CORUNDUM.

decomposed rock are found the veins or beds of Corundum. The principal associates of Canadian Corundum are Spar, Iron Pyrites and Mica. But the discovery of the Canadian mine effectually suppressed the operation of the Southern mines. The finest Corundum ever produced came from near Unionville, Chester County, Pa. Here the ore was of the blue sapphire variety, and, here, too, were found the only *true* loose crystals—pure crystalline Corundum, six sided and free from impurities. The writer possesses four of these crystals which weigh an average of two pounds, as follows:

No. 1.....1 lb. 9 ozs.; size, 1½" × 3 "
No. 2.....1 lb. 13 ozs.; size, 2½" × 2¾"
No. 3.....1 lb. 9 ozs.; size, 2 " × 3¼"
No. 4.....3 lbs.; size, 4 " × 3 "

These mines were worked until 1893 and then abandoned, as the Corundum was found in "pockets" only. It was believed that if a tunnel was dug through the property where surface indications seemed to warrant such action, a large deposit or lead would be encountered Unfortunately, nothing but the associates of Corundum were found, and, after this costly experience, the mines were abandoned permanently. Throughout the section surrounding Unionville, surface pieces of the sapphire variety are frequently found, and if a good "lead" could be located it certainly would prove a bonanza, as this Chester County ore produced the best grinding wheels of their type yet supplied the trade.

There are a number of varieties of Corundum: Sapphire, pink, cream and the white. The quality depends solely upon the percentage of Alumina or Oxide of Aluminum. The Canadian Corundum, when perfectly cleaned, contains about 95 per cent. Alumina. The Southern Corundum only contains about 75 per cent. Alumina on the average. The specific gravity is 3.95 to 4.050. Pure Corundum is No. 9 in the scale of hardness, the diamond being rated as 10.

All the Canadian Corundum is washed after being crushed by great chilled rolls. The crushed ore is then run over a "water-table," across the surface of which it passes by specific gravity; the Corundum being heavier than its associates, drops first from the "table." The Corundum is then passed through a long cylindrical drier and from there it moves to the sieves or screens made from bolting cloth; and from these screens it is packed into bags of one hundred pounds, the number of the Corundum being determined by the mesh or number of holes to the square inch of cloth.

The principal numbers are as follows: 6, 8, 10, 12, 16, 24, 30, 40, 46, 54, 60, 70, 80, 90, 100, 120, 140, 150, 160, 180, F, FF, FFF, FFFF. The first eleven numbers are what are termed "coarse grain," the second nine are the "fine grain," and the last four are "flours."

As before noted, the Corundum is washed with water and then "concentrated" through the use of a concentrator to remove the micaceous associates and other foreign matter. Corundum so treated of course costs more to produce, but this treatment results in a pure article—one which will cut more keenly and prove more durable than otherwise. Unless the Corundum used in the manufacture of grinding wheels be *pure*, they are apt to crack, owing to the presence of foreign matter which "fluxes" in the kiln, the Vitrified Wheels being exposed to about 2,500 degs. F. After the Corundum has been graded in numbers, it is then run over a magnetic separator and the iron (about 4½ per cent.) is removed by this machine.

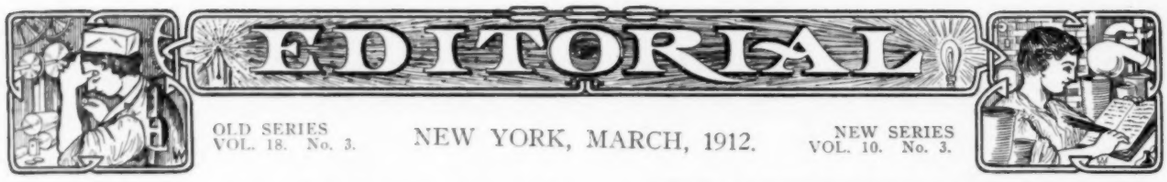
Much improvement has taken place in the manufacture of Corundum in recent years, the principal innovation being the "concentrating" machine, through the use of which Corundum is "mulled." This process also removes the micaceous associates and relieves the Corundum of low-grade ore.

The consumption of Corundum in this country, for both grinding wheels and polishing purposes, is about 1,000,000 pounds per year. And the demand, which is principally for the manufacture of grinding wheels, is really greater than the supply.

The advantage in the use of Corundum over Emery for grinding purposes is that Corundum is harder and sharper (as will be quickly perceived by the use of a magnifying glass in the examination of the grains) but it has additionally a better "fracture" and, incorporated into grinding wheels, it is far superior to Emery in rapidity of cut and durability. It successfully competes with the two artificial abrasives, Alundum (electrically treated Bauxite) and Carborundum (Carbide of Silicon).

The duty on Canadian Corundum, which was one cent per pound, has been removed, and it is, therefore, duty free. While, as previously stated, the amount of Corundum mined is largely used in the making of grinding wheels, it sells to the trade for polishing or grinding purposes for from 10 to 15 cents per pound, the price depending upon the grain desired as well as the quantity purchased at one time. Thus it will be observed that it is a commodity commanding a good price, considering the fact that but 8 per cent. of the ore mined results in commercial Corundum.

*Dealer in corundum products, Philadelphia, Pa.



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THE BRASS FOUNDER AND FINISHER
THE ELECTRO-PLATERS' REVIEW, COPPER AND BRASS

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AMERICAN INSTITUTE OF METALS

The February bulletin of the American Brass Founders' Association contains the report of the proceedings of a recent meeting of the executive committee. The results of this meeting, if finally formally approved by the membership at large, and there is every reason to believe they will be, are of vital importance to the future welfare of the association. The most important of the resolutions passed by the executive committee is the proposed change of name of the society. As is told in the Association and Society department of this issue of THE METAL INDUSTRY, it is proposed to change the name of the American Brass Founders' Association and re-christen the association as The American Institute of Metals. The proposition is now being submitted to the members by means of letter ballot and we have not the slightest doubt but that the change will meet with unqualified approval.

The change in name is as it should be and eminently fitting. The only thought one has is, why was it not done before? Perhaps the time was not ripe, perhaps there was some traditional opposition that had to be overcome gradually, or perhaps, and very likely the true reason, a certain contingency had not arisen to demand it. This contingency which now confronts the managers of the association has to deal with the question of membership. In THE METAL INDUSTRY for February we touched upon the lack of scientific papers included in the proceedings of the society. Without sufficient representation among the membership of scientific men one cannot hope to have them contribute papers. But, the changing of the name of the association lifts it up to the level, so to speak, of the great scientific and engineering societies of the world, and opens the door of membership to anyone interested in the study or practice of the metals.

As THE METAL INDUSTRY has from time to time remarked, and notably in the January, 1911, number, the field of the metals other than iron and steel is large enough and important enough to stand by itself. For this reason, if for no other, the qualifying term non-ferrous can well be dropped and *metals* taken to mean everything *but* iron and steel. American Institute of Metals then, will include all that "Brass Founders" did and more, for "Brass" in itself has a rather restricted range when compared to other "Metals."

The executive committee also recommend a change in the constitution of the association. The clause relating to the annual convention as it now stands binds the Brass Founders to meet at the time and place agreed upon by the American Foundrymen's Association and the Associated Foundry Foremen. The proposed change binds the association to the decision of its own executive com-

mittee. This is as it should be and gives the association more independence as a separate body. While the Brass Founders' Association has a great deal in common with the other foundry associations, still it is now old enough to stand alone and should not be bound by a limiting constitution, although, at the same time, it will probably be found advantageous in a great many ways to join in convention with the sister societies. It can therefore be taken that the proposed change is in no way an attempt to break away from what has been termed the parent association; it is merely the natural growth which causes a desire on the part of the association to be able to spread its wings if necessity should arise or opportunity offer.

The idea of separate meeting rooms for each association is good and one that we hope to see carried out. By that is meant rooms for the business and technical meetings apart from the exhibition hall. This would enable the papers to be read and discussed in peace and comfort without the distracting influence of the exhibits. This scheme, we believe, has been tried before and has been complained of on account of lack of attendance, but this is a matter which will work out itself, particularly if an attractive programme is prepared and, as we remarked last month, far enough in advance to allow for study and *prepared* discussion. Taking it all in all, the proposed changes can work only for the good of the association at large, and it is to be hoped that they will be carried out enthusiastically.

SEPTEMBER CONVENTION

It is all but settled that the foundrymen's convention, which is held annually in connection with the exhibition of foundry supplies and apparatus, will be held this year at Buffalo, N. Y., in September. The change in date, as has been told, is due to the unavoidable delay in making repairs to the only available buildings in Buffalo for the exhibition. The Foundry and Machine Exhibition Company, The American Brass Founders' Association and the Associated Foundry Foremen's Association have expressed themselves as agreeable to the change and it only remains for the American Foundrymen's Association to agree. Dr. Richard Moldenke, the secretary-treasurer, is now taking a letter vote, the outcome of which promises to be favorable.

The holding of the convention and exhibition in September this year will probably mean no exhibition in 1913 unless the date is set permanently in September for the future. To hold two exhibitions eight or nine months apart would probably prove too great an expense and strain on the firms participating. Hence it might be just as well to skip 1913 and have the next exhibit in 1914 in June which after all is the convention month.

NEW BOOKS

THE JOURNAL OF THE INSTITUTE OF METALS, Vol. VI. Size 9 by 6 inches. 369 pages. 21 full page plates and a frontispiece representing Armstrong College, Newcastle-on-Tyne. Edited by the Secretary, G. Shaw Scott, Caxton House, Westminster, S. W.

The major portion of the Journal consists of a series of papers of scientific interest which were read at the annual autumn meeting of the Institute of Metals held in Newcastle-on-Tyne in September, and covers 322 pages. Valuable though these papers were when they were originally presented, their utility is now vastly increased as a result of written communications which have been received since the papers were read, from men eminent in the scientific and metal-working worlds. The papers which are thus reproduced in the Journal include the following: (1) "The Corrosion of Brass With Special Reference to Condenser Tubes," by P. T. Bruhl, M. Sc.; (2) "Further Note on the Nature of Solid Solutions," by C. A. Edwards, M. Sc.; (3)The Electrical Conductivity and Constitution of Alloys," by Dr. W. M. Guertler; (4) "Volume Changes in the Alloys of Copper With Tin," by J. L. Haughton, M. Sc., and Professor T. Turner, M. Sc.; (5) "Non-Ferrous Metals in Railway Work," by George Hughes; (6) "The Failure of a Brazed Joint," by Professor H. Louis, M. A., D. Sc. Assoc.: R. S. M.; (7) "The Mechanical Properties of Hard Drawn Copper," by D. R. Pye, B. A.; (8) "The Alloys of Aluminum and Zinc," by Dr. W. Rosenhain, B. A., and S. L. Archbutt.

In addition to the above papers, all of which were read at the Newcastle-on-Tyne meeting, the volume under review contains a verbatim report of the Second May Lecture (which was delivered by that eminent scientist, Dr. G. T. Beilby, F. R. S., whose subject was "The Hard and Soft States in Metals"). There is also a section devoted to the proceedings of the Birmingham branch of the Institute of Metals. The useful series of abstracts of papers relating to the non-ferrous metals and the industries connected therewith, which was commenced in the second volume of the Journal, has been continued, and there are many pages devoted to valuable abstracts dealing with such subjects as Electro-Metallurgy; The Properties of Metals and Alloys: Metallography; Furnace and Foundry Methods; Analysis, Testing and Pyrometry; Statistics, and Bibliography.

The Journal is issued twice yearly, in June and December, respectively, and is published by the Institute of Metals. All members of the Institute receive bound copies of the Journal gratuitously, but copies can be purchased for one guinea each (net) from the offices of the Institute of Metals, Caxton House, Westminster, S. W.

TRANSACTIONS OF THE AMERICAN BRASS FOUNDERS' ASSOCIATION. Vol. V, 1911. Size 6 by 9 inches; 148 pages, with illustrations. Published by the association, W. M. Corse, secretary, Buffalo, N. Y.

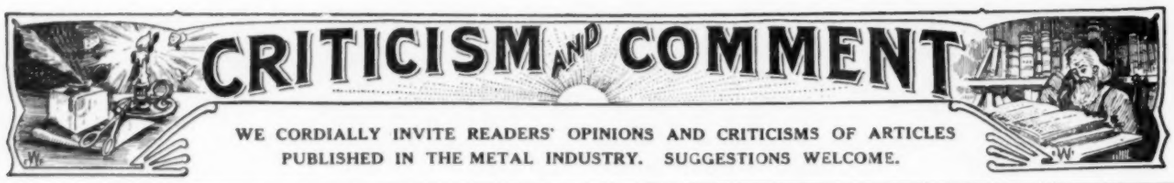
This book contains an account of the annual meeting held in Pittsburgh, May 23-30, 1911, together with the papers read at that meeting and their discussion.

PROCEEDINGS OF THE AMERICAN SOCIETY FOR TESTING MATERIALS. Vol. XI, 1911. Size 6½ by 9 inches; 890 pages, with numerous illustrations. Published by the society, Edgar Marburg, secretary, Philadelphia, Pa.

This voluminous work is a summary of the proceedings of the Fourteenth Annual Meeting, together with reports of the various committees and technical papers. It also contains a list of the officers, members of committees and indices of subject matter and authors.

The United States Geological Survey by George Otis Smith, director, have issued in bound form The Mineral Resources of the United States for 1910.

This matter is contained in two cloth bound volumes, 6½ by 9½ inches in size, of which Part I, containing 617 pages, relates to the metals and Part II, containing 942 pages, to the non-metals. These volumes are made up of the publications of the Geological Survey, which are issued from time to time during the year and from which abstracts have been made during the current year in the columns of THE METAL INDUSTRY.



WE CORDIALLY INVITE READERS' OPINIONS AND CRITICISMS OF ARTICLES PUBLISHED IN THE METAL INDUSTRY. SUGGESTIONS WELCOME.

PLATER'S PLAINT

To the Editor of the Metal Industry:

It would seem, Mr. Editor, that the author of a "Plaiter's Plaint," which appeared in the December, 1911, issue of The Metal Industry, must be suffering from a disease which has been common to platers in the past and one which time does not seem to have cured. He claims that there are too many platers, and his argument is in itself an admission of the fact be up against it, for unless he surrounds himself by a competent set of men, the quantity and quality of his work is bound to suffer, and he is continually the recipient of complaints from his superintendent or the office, and shortly is looking around for another position. Do you not thing that such a one is lacking in at least some of the essentials which go to make a successful foreman?

Don't teach anyone! Dont' help anyone to learn! Mr. Editor, the past has seen too much of this. The man who is satisfied with what he knows and scoffs at anyone who advances new ideas, is the one who soon finds himself, nowadays, looking for another position and saying uncomplimentary things about some one. In my opinion the foreman who tries to do just a little more than is expected of him, and tries to inoculate the same idea into his help, with the idea in view of making himself and his help more valuable to his employer, in the long run wins out. It is sometimes a hard road to travel, and one is many times misunderstood and taken advantage of, but an employer who takes such an advantage is the exception, not the rule.

The successful employer should, and usually does, know his help, and he also knows how to keep them satisfied, realizing that satisfied help is profitable help and he is in business for profit. He also knows that every time he changes foremen or other help it causes losses for a certain time, and he may never obtain a man as proficient as the one discharged, provided said man was proficient.

The latter type of employer rarely changes help, and his positions are always sought for, he therefore being able to obtain the very best of help without seeking for it. The former sort of employer is always changing and his positions are always vacant, or about to be. My remedy for "Plater's Plaint" then would be: Make yourself and your men so valuable to your employer that he cannot afford to lose you, and do this by surrounding yourself by men who will use every effort to master the business and help them to become so by an earnest effort to teach them and allow them to be taught. The standard of the plating business is more and more becoming higher, and we must take good care, brother, to keep it up to that standard or we will be out of it. Put aside false ideas and remember that the demand for first-class men was never greater, so don't fear, but do all in your power to increase your own knowledge and to help others to become more proficient, thereby making your business a more and more profitable one. Everyone has his own ideas; mine are here plainly set forth, and I trust the author of "Plater's Plaint" may take no offense, but read and think of them in the right spirit in which I can sincerely assure him they are meant.

C. O. Field,
Foreman A. F. Meisselbach & Brother.

Newark, N. J., January 31, 1912.

STEEL BALL BURNISHING

To the Editor of The Metal Industry:

In your December, 1911, issue of The Metal Industry, you have an interesting article on "Tumbling Barrels," which includes the modern process of finishing or burnishing by the aid of small hardened steel balls; and in which, your contributor states the process came into vogue seven years ago, and that the idea of using balls originated in the New England watch factory. May I be permitted to state that as a result of much earlier experiments I placed on the market and exhibited this process at Bingly Hall Industrial Exhibition, Birmingham, in 1901, for which I received the Gold Medal Diploma and that I installed in that year among the Birmingham brass and jewelry firms upwards of fifty of my patented "Rapid" reciprocating shaking barrels, designed exclusively for this process; and to date have upwards of eight hundred of these machines working in Birmingham alone.

Further to this I commenced to export to the United States in 1902 (having been granted a patent in that country) my first batch of six machines, which were distributed by R. G. Schutz, of Providence, the then energetic representative of the United Wire & Supply Company, of Providence, R. I., who acted as my agents. As I subsequently sold in U. S. A. many more of these machines, always with the steel ball burnishing process, I think I may claim, that whatever experiments have been made there, "during the last seven years," that they were forestalled by myself, as the process today is exactly identical with my own, widely published and exploited, since thirteen years ago, and which I still supply with my "Rapid" Shaking Machines.

H. Edmonds, of G. Edmonds.

Birmingham, England, January 22, 1912.

PLATING RACKS

To the Editor of The Metal Industry:

The notice in The Metal Industry for January 1912, of patents Nos. 1,010,638 and 1,010,648 relating to electroplating racks is of interest. The description of these racks so closely resemble those of my own invention that a few words in relation to them may not be out of place. Twelve years ago I invented, made and used racks in which the side supporting members are of wood, and the contacts are of copper wire mounted on the side members from cathode rod to work. The next year I invented, made and used racks in which the side and cross connecting members are of wood, small wire nails are driven into the wood to support the work, these work supports being connected to the cathode hooks at the top by wire. About eight years ago I invented another rack in which the side and cross connecting members are of iron. Copper wires being soldered to these members at distances suited to the work. That part of the frame which comes in contact with the solution being taped to prevent deposits on the rack. Since that time I have invented still another rack for a different class of work, which has a base of wood with iron cathode hooks. A revolving rod supported above the solution by the cathode hooks holds a supply of wire for work hooks so arranged that it may be conveniently let down to renew hooks when old ones become too heavily coated for further use and are cut off. Some of these racks are in constant daily use by myself and others. I described them in detail in an article which appeared in The Metal Industry for October, 1911.

Franklin W. Hobbs.

Bangor, Me., February 6, 1912.

OIL SAND CORE INVENTOR DISCOVERED

To the Editor of The Metal Industry:

In your publication of August, 1911, there appeared an article by Alexander E. Outerbridge, Jr., in which he laments the fact that the inventor of oil sand cores is unknown. I believe that my claims to be such are well founded. "Necessity is the Mother of Invention." The necessity having come to me, after various experiments I conceived the idea of an oil sand core 30 years ago.

I would really like to know to satisfy my own curiosity if anyone knows of its use previous. I have so far found no one who could antedate me.

F. J. Karle

Erie, Pa.

Shop Problems

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE OF THE METAL INDUSTRY. ADDRESS THE METAL INDUSTRY.

ALLOYING

Q.—We are manufacturing karat alloys and are having difficulty in getting them bright. They show a smoky red and streaked appearance. Can you suggest a remedy?

A.—We are of the opinion that the trouble you experience in your karat alloys is primarily due to the copper, which may not be sufficiently pure, or the trouble may be due to the oxidization of the copper in melting. It very often occurs in the production of sheet copper that the surface, no matter how brightly polished, will under the proper light show a smoky red and streaked appearance. This is caused when the copper slabs are cast. In the cooling the surface of the slab exposed to the air, becomes coated with a cuprous oxide, which cannot be removed and will show up through the copper no matter how thinly rolled. This does not occur in every slab but it is probably due to the surrounding conditions of the atmosphere at the time of pouring the molten metal. From this observation we should think that your trouble may be due to a similar cause because the gold or silver would not show such streaks when melted together as an alloy or separately. So we would suggest that you change the brand of copper for the alloys and use more caution in the protection of the copper from oxidization during melting.

We suggest the following karat alloys that may work up freer under the dropping operations:

10 karat.
100 fine gold, 100 copper, 40 silver.
14 karat.
140 fine gold, 70 copper, 30 silver.

The above alloys may prove too red for your purpose. In such an event increase the copper content of your alloys and decrease the silver. So long as the color is not materially changed this variation may overcome your trouble and may produce a freer working alloy. We fail to see where your gilding operations should have anything to do with the streaky appearance. If they show in the alloy, the additional gilding operations would not cover them up. When sheet copper contains such streaks you cannot cover them up. If copper or any other metal is deposited, the streaks and dullish color still prevail. It is customary in manufacturing to take note of these conditions and then the copper is worked up so that the under side of the sheet becomes the outside or finished side of the article. The streaks then do not show, no matter how thick or thin the copper may be. By making note of these conditions in rolling the alloys you may be able to overcome the difficulty you experience.—C. H. P.

COATING

Q.—What is the best method of coating steel sheets after stamping? At present I dip them in a composition of white lead, benzine, boiled oil and lamp black, and the results are fairly satisfactory, but the articles dry streaky. Also I should be glad to get a good formula for galvanizing.

A.—The most satisfactory method of coating steel sheets used for ceilings, after stamping, would be to spray them. Spraying machines are used very extensively in the United States for such purpose, not only for plain colors of all descriptions, but for producing blended and shaded tone effects. Any of the firms advertising sprayers in the columns of THE METAL INDUSTRY can furnish the necessary apparatus for doing this class of work. Your dipping method may be improved if the steel plates are first thinly coated with a dilute wood alcohol shellac varnish; or a varnish made up by dissolving gum copal in wood alcohol. Such a coating acts as a size for the regular painting process, not only producing better results by giving a more uniform coating, but also prevents the peeling of the colors from the surface of the steel that frequently occurs. "Galvanizing and Tinning," a book written by a thoroughly practical man, will give you all the necessary information for carrying out galvanizing in a successful manner.—C. H. P.

COLORING

Q.—Can you give me a formula for the blue gray color seen on navigators' instruments, such as sextants, etc.; also is the finish used on voltmeters known as royal copper?

A.—The blue gray color is largely produced by first giving the surface a light coat of silver in the regular bath; then immersing in a hot solution of sulphuret of potassium, using not less than 1 ounce to the gallon. The surface, after oxidizing, is dried out and scratch brushed, using a very soft scratch brush made from crimped brass wire. The polished surface has a good deal to do with the finish, which must not be buffed. It is usually an emery finish, accomplished by leather covered wooden wheels and coated with a 160 emery and then fined down with a flint or steel. This gives the peculiar lustre to these instruments and prevents reflection.

Royal copper is used by the Weston Instrument Company upon their voltmeter cases. The method of producing this finish was described on page 90 of the February, 1911, issue of THE METAL INDUSTRY.—C. H. P.

DIPPING

Q.—We have a large quantity of ball valves to dip bright, and desire suggestions regarding drying. We have tried dipping in aqua fortis, but cannot get the articles to retain their bright finish after allowing them to remain in sawdust.

A.—The reason you cannot retain the bright finish after dipping ball valves in aqua fortis is due to acid stains. These develop very rapidly unless precautions are taken. We suggest the following:

First, cleanse the ball valves in the usual manner; then wash in water and immerse in the aqua fortis dip; then remove and wash again. Second: Now prepare a dip of cyanide of potassium, consisting of cyanide 4 ounces and water 1 gallon. Immerse the dipped and washed valves in this dip for an instant. Third: Wash the valves in boiling water and, if you can procure what is termed in America whale oil soap of platers' compound, add one or two ounces to the gallon. A minute's immersion will be sufficient. Now shake the valves and they should dry spontaneously. If necessary to use sawdust, use ash wood or maple.

A good acid dip consists of the following:

Aqua fortis	1 gal.
Sulphuric acid	1 gal.
Muriatic acid	2 ozs.
Water	1 qt.

If you follow the above instructions, whatever dip you use, you will not be troubled with acid stains.—C. H. P.

FINISHING

Q.—Please give me a formula for Tiffany green. The finish I refer to looks like pearl in the shading of the light and dark green.

A.—To produce the smooth, egg-shell finish noted upon verde green finishes, it is necessary to lacquer the surface and then thoroughly dry wax, using a soft brush and beeswax. The following formula gives good results upon copper and brass by waxing down only after the deposit is dry. To produce the crystalline tone it is always necessary to stipple

the surface of the articles when nearly dry, using what is termed a painter's sash tool. The brush should be slightly moistened with a little of the solution, and then the stippling or painting should be given to the articles. This method separates the surface giving the variegated tone. The formula consists of:

Verdigris	½ lb.
Sal ammoniac	1 lb.
Cream of tartar	¼ lb.
Salt	¾ lb.
Chloride of iron (crystals)	3 ozs.
Water	1 gal.

Immerse or paint the articles with the solution; then allow to dry and finish as mentioned heretofore.—C. H. P.

GALVANIZING

Q.—Kindly inform me how to get a good dull coat of zinc on forged iron

A.—The trouble you experience in not getting a satisfactory galvanized finish on forged iron is because you do not remove the fire scale, which must be removed in order to get the zinc coating to adhere. Prepare a bath consisting of oil of vitriol 10 parts by measure, and water 19 parts; then place your forged iron in the pickle until the fire scale is removed; then wash in cold water, and scour with sea sand. Then place in water, to which is added a little common washing soda (2 to 4 ounces to each gallon of water). This will kill the acid in the iron; then wash and heat up the iron and coat with your flux, which is the soldering acid that you term it, but its proper name is chloride of zinc. Add some sal ammoniac to the acid in the proportion of one-half pound to the gallon; then place in your zinc bath. Be sure to have the metal hot enough. If the iron does not coat the first time, remove, and, while hot, brush it over or immerse quickly in your flux, and then place in your zinc again. You should have no difficulty in getting a good coating, but your iron must be free from fire scale.—C. H. P.

HARDENING

Q.—Kindly inform us what we could mix with pewter to make it hard, to give it a ring?

A.—The hardness of pewter may be regulated by the amount of copper and antimony used in the mixture. The following formula gives a quite hard pewter:

Tin	12 ozs.
Antimony	1 oz.
Copper	4 ozs.

—J. L. J.

LUBRICATING

Q.—What is the best lubricant to use when turning and threading copper rod?

A.—Copper is one of the most difficult metals to work with lathe tools, so you should always see that your tools have the correct clearance and rake, and when threading, see that threading tool is lipped on top. Use mystic compound as a lubricant, which can be secured from any machinist supply company, and has directions on the can. One of the largest electrical manufacturing companies in the country uses milk and has had great success with same.—P. W. B.

MOLDING

Q.—Please give me a good molding sand mixture for flat casting from 500 to 1,000 pounds. We have used Nos. 2 and 4 Albany sand, half and half, for green sand molds. Also we have tried plumbago facing, but it scabs on the drag side.

A.—The sand mixture you name is a good one, and the scabbing is probably due to sticking the plumbago facing with a trowel. Plumbago facing contains considerable clay, which will draw dampness from the mold. It is better not to use a trowel on it, but to blow off the excess of facing with a bellows, or at the most, to rub in the facing with the fingers only.—J. L. J.

OXIDIZING

Q.—How can I oxidize a yellow-brown on bronze?

A.—To prepare a yellow-brown upon bronze, termed commercially architectural bronze, prepare a warm solution consisting of sulphuret of potassium 1 ounce; water, 1 gallon. Use warm. If you wish a finished surface, polish in the regular manner; then cleanse and scratch brush the surface wet. Wash in water and then immerse in the above dip for a few seconds. Then remove, wash and dry well, and then develop the color by the use of a soft brass wire brush, performing this operation dry. If the color is not deep enough, take about a pint of the solution prepared and add to a gallon of cold water. Now immerse the articles as quickly as possible in the toning bath; then wash and dry. This will give you the desired finish, after which lacquer the surface as usual.—C. H. P.

PITTING

Q.—We are sending you a German silver cup, and would thank you to let us know what causes the pitting.

A.—You have probably tried to accomplish the spinning of the cup in one operation, which has caused a distortion of the metal, and gives it a pitted appearance. The only remedy is to start off with your blanks dead soft and, after breaking down, turn over the edge or hammer the shells. Then reanneal, pickle and finish. This will overcome your trouble. In press drawing or spinning of brass, this same trouble frequently occurs. When the metal is hard it becomes elongated or stretched instead of a natural drawing of the metal.—C. H. P.

PLATING

Q.—Please tell me the constituents of a plating bath to give a 14-k. yellow shade. My 14-k. bath is too coppery in color.

A.—The following method should be pursued to produce karat solutions: Procure anodes of the required karat and weigh them carefully. Then arrange your solution in the regular manner, adding 4 to 5 ounces of cyanide and 1 ounce of bisulphite of soda to each gallon of water. Warm your solution. Procure a porous cell, pierce holes in the same so that the cell can be supported on your cathode or work pole with an iron wire. Into the porous cell add a strong solution of cyanide of potassium; then take a number of wire nails, arrange them in a bunch and secure them with a copper wire. Immerse the nails in the porous cell and connect the wire with your negative or work pole. Run a good powerful current through the bath until your anodes yield up at least an ounce troy to each gallon of solution, or a sufficient amount to give you a satisfactory deposit.

Use the same method to keep your bath constant, adding only a small amount of cyanide and you will never be troubled with off karat colors. The composition of a 14-k. bath when used in this manner should consist of:

Pure gold	14
Copper	6
Silver	4

This will give a good yellow color.—C. H. P.

POLISHING

Q.—I would like to know through your valuable paper what grade of emery is used in grinding lead and soft metal.

A.—For polishing lead or lead and antimony, when the scratches are too deep to be removed by cutting down with a regular buff and tripoli, or a sand composition, use a wooden wheel of sufficient diameter and width of face, covered with leather. Then apply a coat of warm glue and roll in No. 160 emery. When thoroughly dry, fine down with a flint stone and then apply tallow. Fine down again and repeat until you obtain what is termed a grease wheel. It is now ready for use. Felt wheels and also canvas sewed buffs are oftentimes used, but for strictly plain surfaces with square edges, the wooden wheel is the best.—C. H. P.

PATENTS

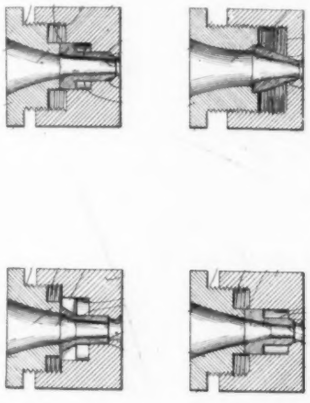
REVIEW OF CURRENT AMERICAN PATENTS OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

1,014,454. January 9, 1912. Method of Copperizing Iron. W. S. Clark, Geelong, Victoria, Australia.

This patent covers a method of copperizing iron, consisting in immersing the iron in a pickling solution and rubbing the same until it presents bright surfaces, transferring the iron to a second bath containing an acidified solution of copper sulphate and allowing it to remain in the latter until the desired coating of copper is deposited thereon, removing the copper coated iron from the second bath and drying the same and then passing the coated iron through a furnace heated to the melting point of copper, and finally plunging the coated iron into a bath of boracic acid flux immediately on the removal of said coated iron from the furnace.

1,015,913. January 30, 1912. Apparatus for Drawing Wire. J. Stratton, Altingham, and E. A. Claremont, Old Trafford, Manchester, England.

The machine shown in cut relates especially to wire drawing apparatus of this type in which the compressing funnel is preferably given a greater angle than the portion of the die or die point which is brought into engagement therewith to promote the localized compression of the discharge end or throat of the die, the die end being if desired of reduced substantially uniform section for a considerable distance adjacent its end, so that it can be forced for a considerable distance into engagement with the compressing funnel so as to successfully compress different portions of the die end and reduce the gage of the throat before it is necessary to remove and reshape the die end to insure its proper co-operation with the compressing funnel; also if desired the die may be held in alignment with the co-operating compressing funnel in the cap or die holder member by forming suitable co-operating guiding members on the cap and die, thus minimizing lateral distortion of the die during its compression.



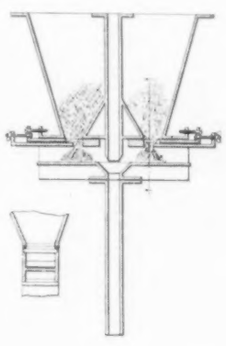
1,014,946. January 16, 1912. Alloy for Coating with Metal. C. F. Burgess, Madison, Wis. Assignor to United States Sherardizing Company, New Castle, Pa.

According to the preferred embodiment of the present invention, galvanizer's dross is utilized as the basis for the production, in novel manner, of an alloy or composition of matter containing zinc and iron, and having extreme brittleness, and having also other special characteristics which render it valuable for use in the arts. To make up the alloy or composition, zinc dross of ordinary commercial purity is crushed or broken into lumps and is then placed in a rotary iron drum, together with a quantity of relatively pure iron, such as wrought iron, or electrolytic iron, in the form of chunks or small pieces. This charge of dross and iron is then heated to red heat (about 850 degs. Fahr.), with continued rotation of the drum.

It has been found that at this temperature, which is well below the melting point of the dross, the iron and dross appear to combine, and the iron, as such, disappears. By adding the iron in suitable proportions, all of the iron may be caused to combine with the dross, yielding an alloy of about the composition $FeZn_{10}$. This alloy has properties differing in many ways from those of its constituent metals. It is exceedingly brittle, and the rotation of the drum causes the lumps or particles of alloy to grind on one another, thereby reducing substantially the entire charge to a granular condition. The alloy, when thus reduced to granular condition, can be heated to a temperature in the neighborhood of 1,300 degs. Fahr. without fusion and without sintering of the particles into a coherent mass. In this respect, it is quite different from pulverized zinc, which fuses at about 740 degs. Fahr. When in granular condition, the alloy $FeZn_{10}$ is light gray, and the individual granules or particles appear to be regularly crystalline in structure.

1,016,415. February 6, 1912. Sand-Blast Device. Albert Jorn, Jr., Waukegan, Ill.

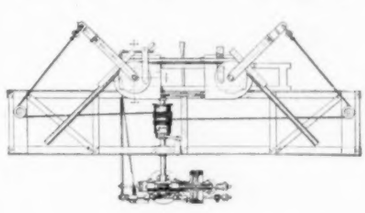
For the manufacture of sand-blasts where nozzles of considerable length have been employed, it has been extremely difficult to obtain an even and constant volume of sand supplied to the nozzle and which is necessary in order to produce a uniform blast at all times.



One of the objects of the present invention, as shown in cut, is to provide means whereby sand may be piled close to the nozzle and said pile maintained of uniform proportions, the pile of sand being so positioned that a partial vacuum created by the passage of air into and through the nozzle, will result in the even supply of sand to the nozzle throughout the length of said nozzle. Another object is to provide means whereby the proportions of the sand ridge or pile may be varied so as to vary the amount of sand fed to the nozzle.

1,016,771. February 6, 1912. Metal-Bending Machine. A. H. Plaute, Atlanta, Ga., assignor to Atlanta Metal Bed Company of Atlanta.

This invention provides a machine, shown in cut, particularly designed for bending metal tubing, but which may be advantageously employed for bending metal rods or bars or material of like nature. In the manufacture of metal beds from tubing the latter has generally been shaped by hand, which is a tedious and somewhat expensive operation. The present invention provides a machine the object of which is to admit of the metal tubing being bent into the required shape without crushing or disturbing the cross sectional outline of the tubing. The invention provides a machine which is practically automatic in operation after being started, the operating parts being thrown out of action after the predetermined result has been attained.



1,016,549. February 6, 1912. Iron-Nickel-Copper Alloy. G. H Clamer, Philadelphia, Pa.

The objects of the present invention are first, to provide iron-copper-nickel alloys which are possessed of new uses and properties and are practically non-corrosive, which are of a low coefficient of expansion and of great mechanical strength, which can be rolled into sheets, rods and the like, and which can be comparatively cheaply produced; and second, to provide a method or process of making a homogeneous iron-nickel-copper alloy in

which on casting and cooling, no separation of metal in the form of hard nodules or otherwise occurs.

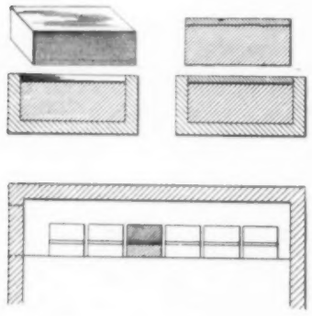
The alloy is of whitish color and it can be made within the following range of proportions by weight:

Nickel	25 to 50%
Copper	5 to 20%
Iron	30 to 70%

together with a small amount of impurities, such as would ordinarily exist in commercial steel, copper and nickel. Within the proportions stated the new and useful properties are attained. Carbon should not be present in amount sufficient to produce hard nodules of copper or copper mixed with nickel or of any kind.

1,016,350. February 6, 1912. Brick for Metallurgic Furnaces. William N. McKnight and R. H. Youngman, Pittsburgh, Pa., assignors to Harbison-Walker Refractories Company, of the same city.

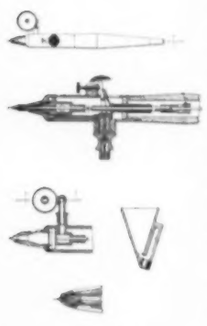
The object of the invention is to provide a brick, as shown in cut, for metallurgic furnaces whose body-portion is composed of a material which will resist high temperatures without yielding to pressure or losing its shape, and whose exposed side is composed of material that will likewise resist high temperatures and at the same time offer greater resistance to the chemical action of metals, slags, gases, etc.



The brick is composed of two parts, the larger part or main body of the brick being made of a material which will resist high temperatures without yielding to pressure or losing its shape. For this purpose there may be employed a burned silica brick, or the body of the brick may be formed of suitable fireclay. The brick-body is placed in a suitable mold, said mold being of such depth that when the brick-body is placed therein the exposed surface of the brick-body will be below the surface of the mold. A coating of good quality plastic clay or other material that wil fuse at a slightly lower temperature than the material of which the brick-body is made or with which it is to be fused, is applied to the surface of the brick-body to be faced by spreading thereon a thin coating of such material. After a coating of this character has been applied, the material to form the thinner portion of the brick is to be introduced into the mold and fills up the space not occupied by the brick-body.

1,017,358. February 13, 1912. Air-Brush. Olaus C. Wold, Chicago, Ill.

The main object of the present invention is to provide an air brush, shown in cut, which will deliver the color in the form of a spray, resembling as much as possible the effect which is produced in drawing a line with a fine hair brush. To this end means are provided for delivering a fine jet of air on each side of the color orifice, the result being that the color is delivered in the form of a very fine flat jet. Other objects are to generally improve the discharge end of the air brush, and to construct it in such manner that the air chamber and discharge pipes will be easily accessible for the purposes of cleaning or repair without in any way disturbing the needle valve and associated parts which control the flow of color. Also to provide an air discharge member of such form that it may be easily removed and replaced by one having larger openings, and adapted to deliver larger jets of air for rougher or heavier work.



1,017,629. February 13, 1912. Manufacturing and Refining Copper Alloys. W. S. Rockey and H. Eldridge, New York, assignors to Metallurgical Research Company, Arizona Territory.

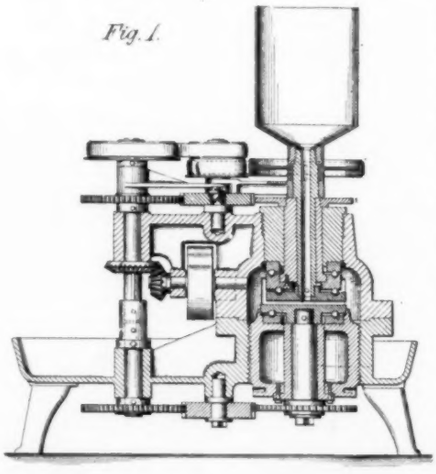
This is a patent in the manufacturing and refining of copper alloys covered by 21 claims of which the first is the following:

The inventors claim the process of refining and manufacturing copper alloy consisting in first reducing to a fluid condition by heat a flux containing boron trioxid, then fusing the alloying metal under the flux and then reducing the copper by heat to a fluid condition and protecting the same from oxidation by carbon and then flowing the copper into the flux, thus joining the alloying metal to form the copper alloy and protecting same beneath the surface thereof while maintaining the heat thereon to expel the gases and impurities therefrom into the flux.

1,017,125. February 13, 1912. Ball-Rolling Machine. G. E. Abbott, Hartford, Conn.

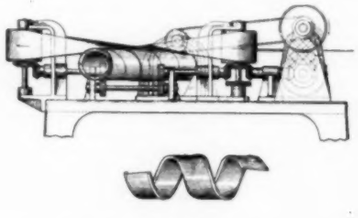
The machine shown in cut is intended for rolling balls, and more especially to those adapted for receiving and rounding balls made from metal which in its original form consists of rods from which sections are cut off, these sections subsequently being subjected to the action of dies whereby an approximately spherical form will be imparted thereto. This invention has for one of its objects, the provision of a machine of this character which comprises a hopper into which a number of blanks are placed, and are then fed gravitatively in between a pair of co-operative platens whereby the balls are shaped as required. The invention has, furthermore, for its object, the provision of mechanisms whereby either one or both of said platens may be rotated on their own axes; while one of them is revolved around a fixed axis which is eccentrically disposed to its axis of rotation.

Fig. 1.



1,018,291. February 20, 1912. Machine for Making Metal Tubes. G. W. Beadle, Bayonne, N. J., assignor to Single Service Package Corporation, New York, N. Y.

This invention relates to machines for making spirally wound tubing, and has for its object to produce a mechanism for manufacturing such tubing out of a single strip of material and at the same time effectually closing the seams between contiguous edges of the strip.



Among the claims covering the machine shown in cut is the following:

6. In a tube-forming machine the combination of a pair of strip feeding rollers; a pair of strip flanging rollers; a pair of flange finishing rollers; means for rotating the finishing rollers in a direction opposite to that in which the strip is fed; a mandrel around which the strip may be wound and provided with a groove; a pressing roller coacting with the mandrel to cause the finished flanges of the strip to interlock to form a seam; and a belt encircling the mandrel adapted to move the finished tube along the axis thereof.

INDUSTRIAL

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

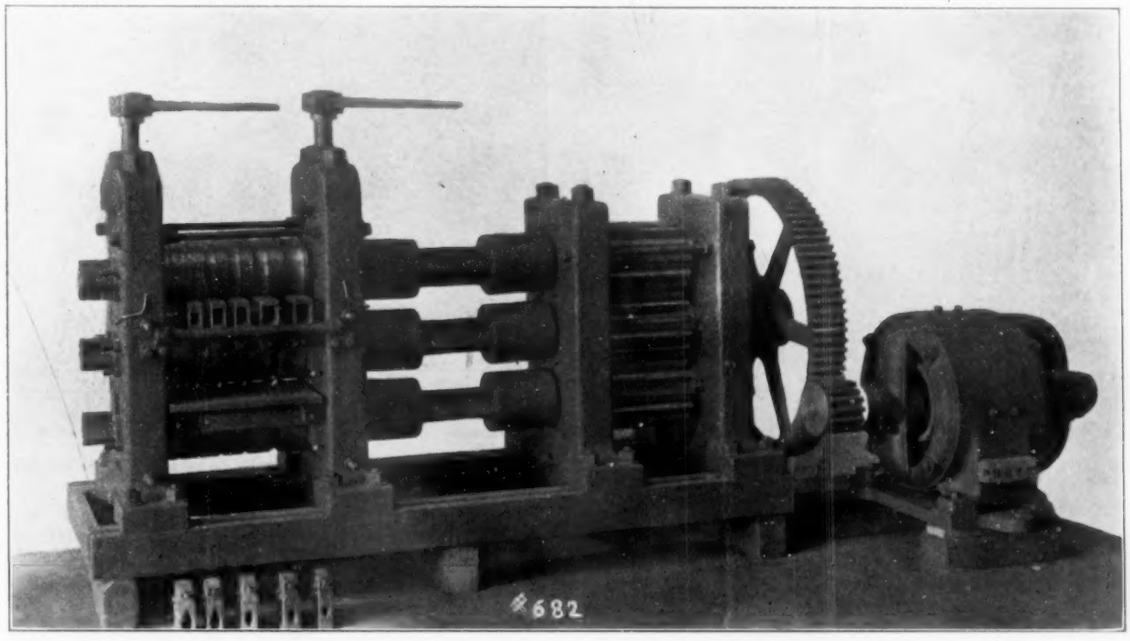
A NEW THREE-HIGH ROD MILL

The mill shown in cut is known as a 9 x 18-in. three-high rod mill, and is motor driven. The mill is designed to roll hot copper rods from 1 in. square down to 1/3 in. round. The rods are run through the rolls ten times, alternating between a square and an oval, until it is pretty near down to size, when it is changed into a round. The rolls are of best quality chilled iron 9 ins. diameter in the bodies, 18 ins. long on the face. The are accurately finished on the surfaces, and grooved to suit the rods which are to be rolled. The journals are of suitable size to do the work required, and are accurately ground and polished to suit the bearings.

The roll housings are of semi-steel of the top cap pattern, of modern design, heavy and substantial. The caps are accurately planed to suit the roll housings, and are held in place by cap bolts of ample proportions; the cap is also tapped out to suit the adjusting screw. The roll housings are machined to suit the boxes and also the bedplate. The boxes are of cast iron, made in halves, and each is fitted with a half brass liner. They are adjusted by the top adjusting screw and wedges so that the rolls are held rigidly in position at all times. Suitable means for lubricating the roll journal boxes are provided. Suitable means are also provided in the roll housings to adjust the rolls endwise so that the grooves can always be held in perfect alignment.

The pinions are of steel with machine cut teeth, carried in housings of modern design, heavy and substantial, accurately machined to suit the bedplates and the pinion bearings. These housings are of the top cap type, the caps being accurately machined to suit the housings, and each held in position by cap bolts of ample size. The pinion journal boxes are of cast iron lined with best babbitt and bored for a running fit. Ample means are provided for lubrication.

The bedplate is of cast iron, heavy and substantial, is accurately machined to suit the roll housings and the pinion housings, these housings setting on one bedplate insure their perfect alignment with each other. On the middle pinion neck there is keyed the main driving gear. This gear is of cast iron with machine-cut teeth, accurately bored and keyed to the roll neck. The pinion which meshes with this gear is of rawhide, and is keyed to the armature shaft of the motor. The motor is supported on the cast iron bedplate furnished with the machine. This bedplate is bolted to the mill bedplate so that the gears are always held rigidly on the centers on which they are designed to work. There are three cast iron spindles each 18 ins. long and six cast iron couplings, connecting the rolls and the pinions together. All foundation bolts and plates are furnished with the outfit; in fact, the machine is furnished complete, ready to run, with the exception of the motor. This mill is manufactured by the Farrel Foundry and Machine Company, Ansonia, Conn.



NEW THREE-HIGH ROD MILL FOR HOT COPPER. FARREL FOUNDRY AND MACHINE COMPANY, ANSONIA, CONN.

POLISHING LEATHERS

The Peckham Manufacturing Company, 246 South street, Newark, N. J., are producing a line of polishing leathers and leather meal which are enjoying a constantly increasing popularity among users of such classes of materials. Very high efficiency is claimed for the leather meal as it is said to surpass all of the old-time scrap polishing materials. It is very soft, light and bulky and is effective on light and heavy work and does not roll or mat into balls or cakes. As the meal never wears out and can be used over and over again it makes a big saving in the cost of polishing materials. All it is necessary to do is to keep the barrel filled with a uniform quantity, replenishing such meal as is lost when opening the barrel for changing the work.

For polishing work that is open or of a tubular formation, which would allow the meal to pack in and fill up the spaces, small irregular pieces of leather are used in place of the meal. The price of the polishing meal is four cents per pound and the cut leather three cents, and the products are packed in compressed bales, weighing about 400 pounds each and are shipped f. o. b. Newark. The Peckham Company also produces a polishing material known as "Floated Silica," a small quantity of which added to the leather compounds will produce extra good results.

OXY-ACETYLENE WELDING OUTFIT

The acetylene and oxygen generators shown in the cuts are manufactured by the Oxi-Carbi Company of New Haven, Conn., and form a part of the outfit manufactured by them for the autogenous welding of metals. The acetylene generator is of the carbide to water type, and has all of the most approved interference devices required by the Board of Fire Underwriters. Its most particular feature is the carbide being shut off from the water at all times when not feeding, and there is no possibility of the carbide rattling into the water at any time during transportation, which would cause generation of gas. The generation is very simple in operation, as it is actuated by the weight falling against pressure, and the action gives very close pressure of gas

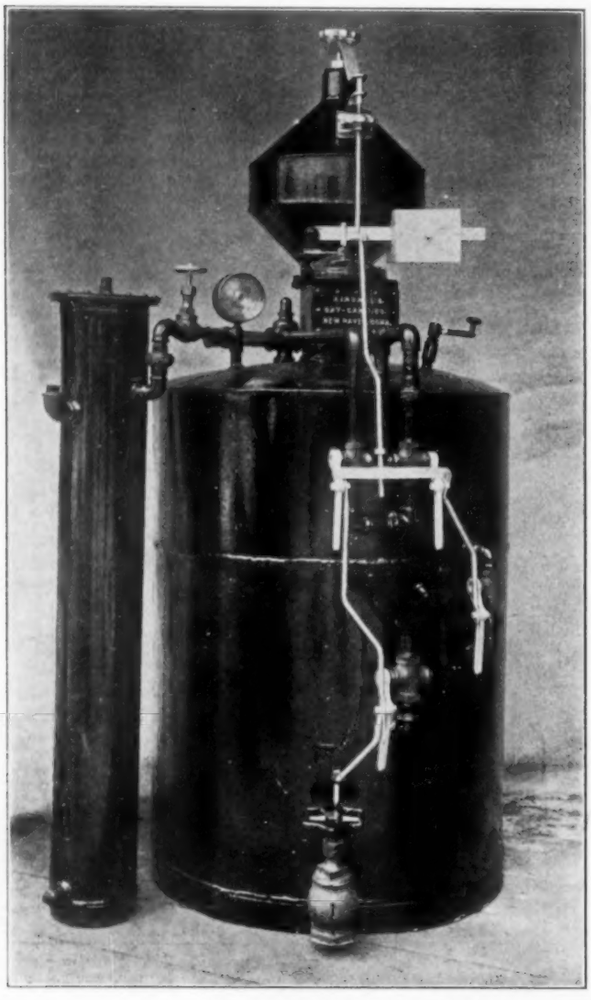


FIG. 1. THE ACETYLENE GENERATOR.

at the blow-pipe. Among its important features is the very small amount of air admitted to the machine when emptying, which is not exhausted when refilling with water.

The stationary oxygen generation outfit illustrates the continuous generation of oxygen. To the right of the tank there is a retort in which the chemicals are placed. Underneath these, gas jets are burned until the chemicals reach the proper heat to give off their oxygen in the form of gas, which goes through the scrubber, and from there into the storage tank, shown at the extreme left. The double gauge arrangement eliminates all guesswork in the extraction of oxygen from the chemicals by closing the valve on the inlet to the tank. The movement of the gauge indicates generating or exhaustion, thus saving much needless waste of time and guessing. By using a series of generators one can be generating gas while the next one is cooling off from its former charge, and a second one is being cleaned from the old charge and refilled with a new one. As many of these generators can, of course, be used as are needed to keep the volume of gas going into the storage tank equal to that which is being drawn out by the torches for the welding or cutting of metals.

The most important part of an Oxy-Acetylene welding and cutting machine is the torch. This torch or blow-pipe is constructed so as to mix the gases in proper proportion to weld without injuring the metal and at the same time to preserve an absolute neutral flame through the most trying conditions. Frequent adjustment of the flame for any reason causes the metal to warp, thus making a smooth seam impossible. In the accompanying picture a small torch is shown with five welding tips; the larger is

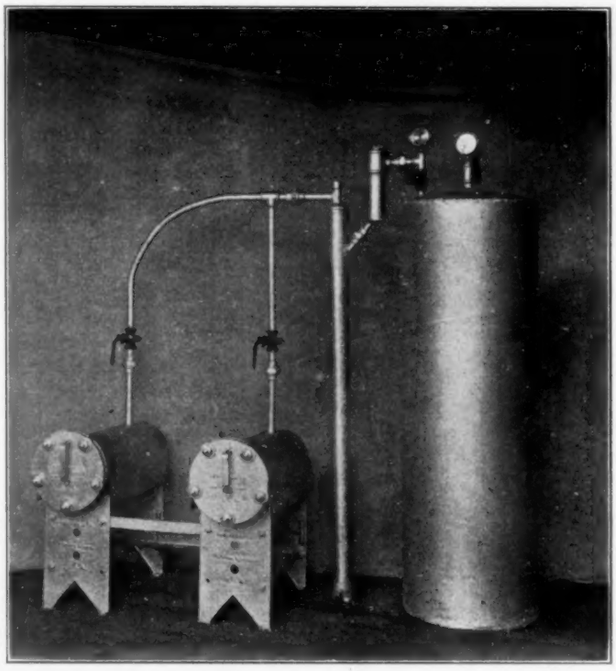


FIG. 2. OXYGEN GENERATOR WITH DOUBLE RETORT.

the combination torch with cutting attachment ready for service. In the Oxy-Carbi torch, the matter of constant mixture is perfectly regulated and made possible of manipulation. A number of nozzles are supplied having different sized central holes delivering the proper size flame for different thicknesses of metal. The acetylene inlet is constructed so as to eliminate the possibility of flash-backs. Additional flash-back preventers are placed in the acetylene pipe, utterly preventing any flame passing farther than the mixing chamber, should this in any way occur. There is no

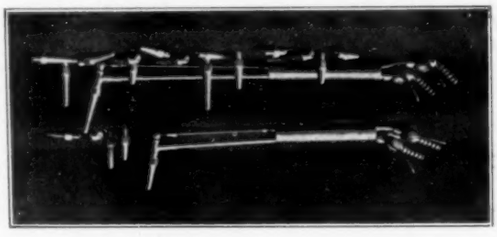


FIG. 3. THE OXY-CARBI TORCH.

screen to clog in this torch, and it is said to be without doubt the lightest and most easily handled oxy-acetylene torch ever constructed. It is only necessary to remove this welding tip, insert the auxiliary nipple, screw on the cutting nozzle and it is transformed into a cutting pipe with great power of penetration.

The large bronze casting shown in Fig. 4 is an example of a difficult operation performed by this torch. Twelve inches down in

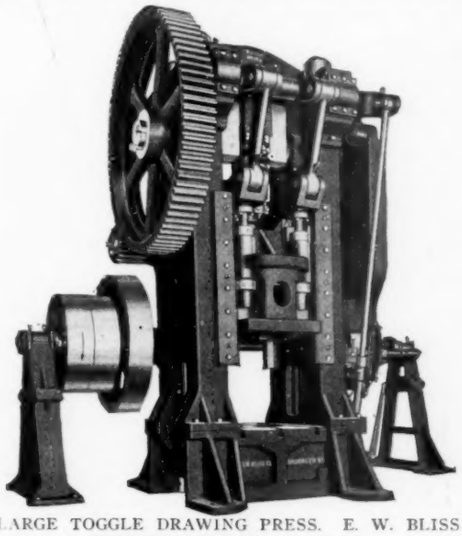
the center hole of this large pump base was a cold shut in the casting of the partition, as the space was tapered at this point, the opening was only two inches high, making it very difficult to operate the blow-pipe and weld a piece into the partition, but

FIG. 4. LARGE BRONZE CASTING WELDED BY OXY-CARBI PROCESS.

owing to the possibility of working with a very short tip in close quarters a piece was welded over the hole entirely satisfactory. Another hole in the partition was repaired by removing a piece from the end of the cylinder and replacing, as the mark shows. Those who have had the experience of trying to operate a blow-pipe in a small hole can realize the difficulty of this repair.

LARGE TOGGLE DRAWING PRESS

Shown in the accompanying illustration is a very large toggle drawing press having 450 tons working power, it being the largest machine of this type which has up to the present been built by the E. W. Bliss Company, of Brooklyn, N. Y. The press is adapted for drawing a large variety of heavy work, the particular one shown having been built for automobile work in the



LARGE TOGGLE DRAWING PRESS. E. W. BLISS COMPANY, BROOKLYN, N. Y.

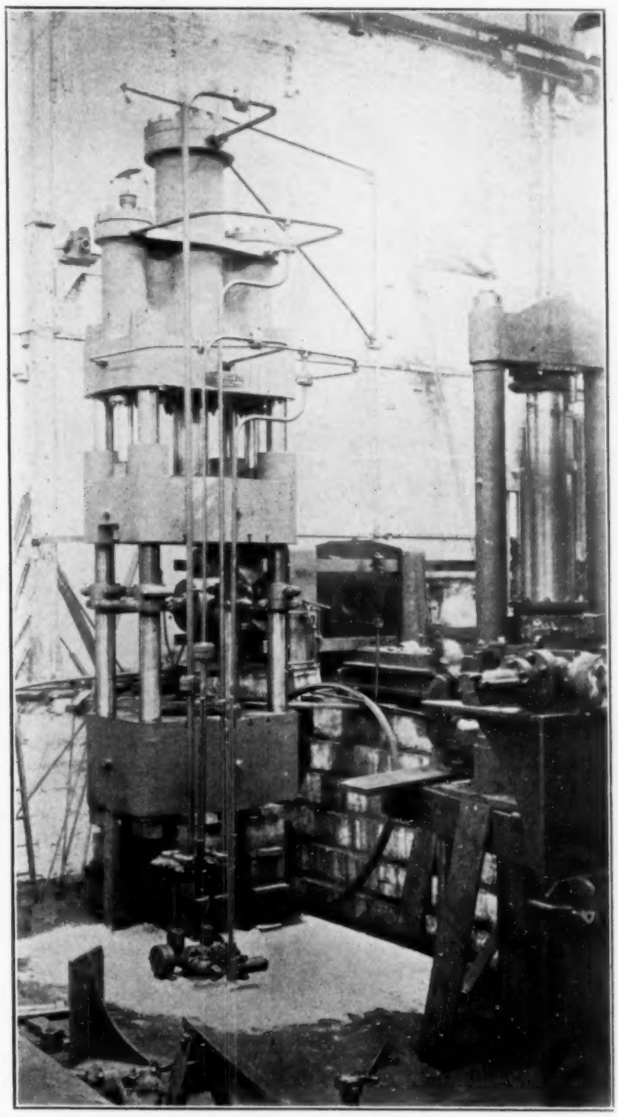
drawing of brake drums and such heavy work. The machine is of the built-up type construction, in which four large vertical tie rods receive all the strain, relieving the frame columns of the pressure exerted in operation. The frame columns are of box section, and of very large cross sectional area, imparting great rapidity to the entire press.

The entire train of gearing is steel as well as the rock shafts. The inner slide is operated by the crank shaft direct through an adjustable connection. The blank holder slide is operated by two rock shafts connected by a system of links with the main crank shaft, imparting a uniform pressure to the blank. The strain arising from the pressure put upon the blank is transferred through straightened toggles directly to the tie rods, thus relieving from all friction due to blank holding. The machine is operated and controlled by a hand lever operating a powerful friction clutch on new type, designed especialy for heavy duty. By means of this clutch, the machine is always under instant control, and may be started or stopped at any point of the stroke.

Some of the principal dimensions are: Stroke of inner slide, 24 ins.; stroke of outer slide, 16 ins.; largest blank diameter, 38 ins.; largest punch diameter, 26 ins. Will draw and lift out up to 11½ ins. in height. Flywheel, 60 x 10 ins.; weight of flywheel, 3,000 lbs.; total weight of machine, 130,000 lbs.

NEW DRAWING PRESS

This illustration shows a large hydraulic drawing press recently built by R. D. Wood & Company, of Philadelphia, which has a capacity to draw a shell 34 ins. deep and handling



A NEW DRAWING PRESS MANUFACTURED BY R. D. WOOD & COMPANY, PHILADELPHIA, PA.

a 48-in. diameter blank. It is provided with a main or drawing ram and 2 clamping rams. The advantage of a hydraulic machine for this class of work, it is said, lies in the complete

control the operator has at all times over the work, and also in the fact that the machine exerts a fixed pressure at all points of the stroke. The pressure can also be held for any length of time. This is very essential for some classes of work, as it gives the metal an opportunity to set. R. D. Wood & Company are also manufacturers of hydraulic draw benches, testing machines, and cabbage machines or baling presses as well as hydraulic accumulators, all suitable for the brass works and rolling mills.

NEW BELT STRAPPING ATTACHMENT

This belt strapping attachment, shown in cut, was just recently brought out by the Webster & Perks Tool Company, of Springfield, Ohio, manufacturers of a very complete and efficient line of grinding, polishing and buffing machinery, to meet the demand for a strapping attachment in keeping with the rest of the line.

This attachment differs from all others, since instead of levers, racks, etc., commonly used for belt tightening or adjustment, a sliding head mounted on a substantial column and operated by a hand screw is used, allowing a greater variation, and precluding any possibility of belts flying off through failure of the tightening mechanism. The illustration shows the same applied to a No. 4 overhanging head lathe, but it can be used on any machine whose spindle diameter between flanges is 1 in. to 1½ ins. The sliding head carries the loose pulley, which is provided with a phosphor bronze bushing; is perfectly machined and carefully fitted. Flange pulleys are finished all over and accurately balanced. The

THE WEBSTER & PERKS BELT STRAPPER.

specifications are as follows: Size of flange pulleys, 8 ins. diameter by 2⅝ ins.; length of travel of sliding head, 4 ins.; height from door to center of spindle, 38½ ins.; weight, complete, 250 lbs.

The manufacturers would be pleased to submit literature of this as well as of their grinding and polishing machinery and attachments on application.

WHITE LACQUER ENAMEL

The popular finish today for many articles, such as clocks, frames, mirror toilet sets, jewel boxes and a long list of other metal goods is old ivory, or French ivory, which originated with W. J. Smart of the Eureka Pneumatic Spray Company, New York City, who says he showed the trade and manufacturers how to make it.

A great objection to this finish and also the white has been the lasting odor, which has deterred many from adopting finishes made with pigment lacquer, also the item of cost due to the number of coats required to produce a finish of good appearance, and the fact that some makes of enamel are unreliable, and will peel and chip. The Eureka Pneumatic Spray Company offers a new white enamel, which they say is odorless as soon as it is dry, and nearly so while spraying. It will cling to any metal or wood free from oil or wax, and covers in one coat an area equal to three coats of other enamels. A beautiful white is made while spraying and when dry, simply brushing with a clean tampico brush, turpentine, vaseline, paraffin oil, etc., will give a high polish without turning work yellow.

In spraying this enamel, a large fluid tip should be used, the object being to get the enamel on quick, showing a wet looking surface, which may be depended on to dry down smooth and cling tightly. One heavy body coat so applied is sufficient. To produce an ivory finish the following directions are given: When the work is dry put dry burnt umber in a saucer or plate, and spirits of turpentine in another, dip an ordinary painter's sash tool lightly in the turpentine and then in the umber, rub on a piece of glass, and apply to the article with the brush only slightly wet. Simply daub it all over and wipe off with a cloth, and set away for half hour. Then fold a clean cloth over the finger, being sure that it is only damp with turpentine, and relieve and tone the article, after which brush with a clean tampico brush. This method will bring out the relief clean and clear, and the work will not have that dirty look that so much of the so-called ivory finish has. The Eureka Pneumatic Spray Company announce that not only do they now offer an odorless enamel, but that they are cutting prices on the same, and the economy of one coat work is a very important consideration.

HAND TUBE BENDING MACHINES

The cut shows a double-ended hand bending machine, suitable for making two bends in the same piece of pipe or tube at the same time, as it often required to be done in making windshield frames for automobiles, and in bending bedstead tubes, etc. These hand bending machines can be furnished either with two bending heads or with one bending head, the latter machine being suitable for use where only one bend is required to be made in each piece of tubing handled. The bending machine is capable of bending brass and copper tubing of ordinary gauges, say from 12 to 20 B. & S. up to 1½ ins. O. D. on any practical radius up to 8 ins., handling

THE HAND TUBE BENDING MACHINE.

any length of tubing, and making bends at any desired angle. It will also handle iron or steel pipe up to 1¼ ins. Of course, the smaller the radius of the bend, the more difficult it is to secure a perfect piece of work which will be free from wrinkles or flattening of tubing. By the use of patented ball mandrels and grooved formers, it is possible to bend tubing on a radius as small as the diameter of the tubing itself. That is, 1-in. O. D. tubing can be bent on 1-in. radius, and this can be accomplished without wrinkling the tubing on the inside of the bend, or flattening it on the outside. The old fashioned way of bending pipe and tube on small radius is to fill the tube to be bent with some material, such as resin or sand, and to pull the tube around the form, the filling material preventing it from wrinkling or flattening. The machine does away with the necessity of filling the tube, and thereby enables the work to be done better and faster.

This machine is manufactured by the Tube Bending and Polishing Machine Company of Baltimore, Md., who are developing a full line of bending machines for bending brass and copper tubing from the smallest sizes up to 3 and 4 ins. in diameter; also for bending steel and iron pipe or tube, either hot or cold, up to 3 ins. in diameter. They are now prepared to furnish on reasonably prompt delivery the smaller types of machine, which are operated by hand, the same as the one illustrated in the cut, and are prepared to quote for future delivery on power machines for handling the heavier work. Two types of the power machines are belt driven. These machines are all constructed under the L. H. Brinkman patents, and the line will be, it is believed by the company, the only standardized line of tube bending machinery on the market.

ITEMS OF INTEREST TO THE INDIVIDUAL.

Zeno F. Barns, assistant metallurgist of the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., has accepted a position as metallurgist of the Empire Smelting Company, Buffalo, N. Y. Mr. Barns is a specialist on white metals and drosses.

Arthur Lewis has been elected vice-president and treasurer of the Swan & Finch Company, New York, importers of oils and greases of all kinds and the original manufacturers of Platers Compound. Mr. Lewis has been connected with the company for some time in the capacity of general manager.

R. P. Dickerman, who for the past ten years has been selling agent for the Waterbury Manufacturing Company, in New York, has terminated his connections. Mr. Dickerman is now devoting his time to breeding pure bred cattle on his estate at Southington, Conn., where he has a very fine herd of Holstein Fresian stock.

John N. Allen, 738 Oliver Building, Pittsburgh, Pa., has been appointed sales agent in Pittsburgh territory for the Monarch Engineering & Manufacturing Company, of Baltimore, Md., manufacturers of the "Steele-Harvey" crucible melting furnaces, Monarch core ovens, oil burners, blowers, heating furnaces for rivet, bolt, bar, and angle and plate iron, etc.

George H. Chandler, 151 West 70th street, New York, well known to the plating trade as the New York representative and export sales manager of the Levett Manufacturing Company, and later in a similar capacity with the Munning-Loeb Company, of Matawan, N. J., severed his connection with the latter company on March 1. Mr. Chandler will remain in the trade, but has not yet formed new connections.

On account of the rapid growth of business the Remington Typewriter Works have found it necessary to divide the polishing department of their plant into two departments, viz., the east and west. Theodore H. Schesch will have charge of the west department, and Philo O. Baker of the east. The item regarding this change published in the February issue of THE METAL INDUSTRY stated that the plating department was included in the change. This is incorrect, as Mr. Robinson has been and is still foreman of the plating operations.

DEATHS

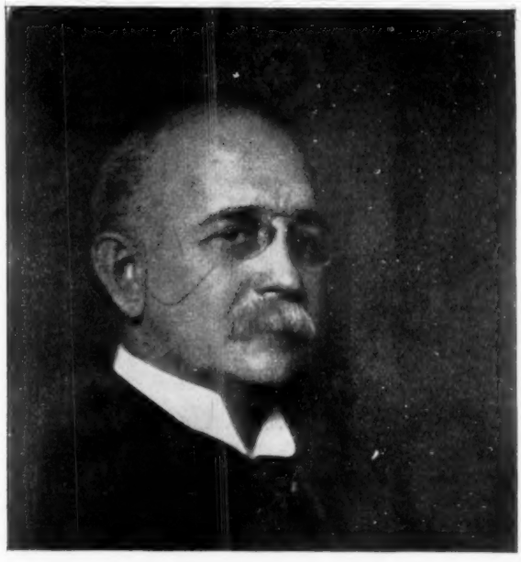
As we go to press we learn of the death of R. R. Mitchell, of Robert Mitchell Company, Ltd., Montreal, Quebec. Mr. Mitchell was vice-president of the American Brass Founders' Association for Toronto, Ontario, Quebec and the maritime provinces.

John H. O'Donnell, who was well known in the trade as a designer and manufacturer of wire machinery, died at his home in Waterbury, Conn., on February 27, at the age of forty-eight At the time of his death Mr. O'Donnell was connected with the Waterbury Farrel Foundry & Machine Company as superintendent of the wire machinery manufacturing department.

George H. Turner, vice-president of the American Brass Company, died suddenly at the Hahnemann Hospital, New York, on Tuesday, February 27, at the age of forty-five. Mr. Turner was a native of Prince Edward Island, and practically all of his life was spent in the metal industry. He was associated with the firm of Wallace & Sons of Ansonia, Conn., and when the factory of this concern was purchased by the Coe Brass Company, Mr. Turner became connected with that company, where he continued for ten years. In 1905 he came to Torrington, and successively held the offices of assistant secretary and secretary of the Coe Brass Company, and a vice-president of the American Brass Company since the first of the present year, when the subsidiary companies were taken over by the holding company. He is survived by his wife, mother, one brother and one sister.

FRANCIS H. STILLMAN

Francis H. Stillman, president of The Watson-Stillman Company, New York, and a prominent figure in machine tool engineering industries, died suddenly Sunday morning, February 18, of intestinal hemorrhage, at his late residence, 105 Rodney street, Brooklyn, in his sixty-second year. The day before his death he was at his office as usual and apparently in the best of health. Mr. Stillman was born in New York on February 20, 1850, was graduated from Yale in the class of 1874 with the degree of B. S., and is survived by his wife, formerly Miss Irene A. Bancroft of Boston, and by two sons, Austin Frank and Edwin Arthur Stillman. He was a member of the Hanover Club of Brooklyn, the Engineers Club, the American Society of Mechanical Engineers, and treasurer and continuously throughout its existence a director of the National Association of Manufacturers. He organized and was first president of the Machinery Club of New York, and was also first president of the National Metal Trades Association. In addition to being president of The Watson-Stillman Company at the time of his death, he was also president of the Bridgeport Motor Company, and of the Pequannock Commercial Company, and a director of other manufacturing firms.



FRANCIS H. STILLMAN.

Aside from his continuous activities in various engineering organizations and projects, Mr. Stillman was one of the recognized pioneers, and became perhaps the most prominent American engineer on hydraulic machine tool construction. On leaving college, Mr. Stillman first associated himself with the Cottrell Printing Press Company, then with his stepfather, Mr. Lyons. In 1883 he organized and became president of the firm of Watson & Stillman, which succeeded Lyons & Company. The firm was incorporated in 1904 as The Watson-Stillman Company, Mr. Stillman remaining its president up to the time of his death. Under Mr. Stillman's direction, his firm early became prominent in the hydraulic engineering field, has built upwards of 4,000 different types and sizes of hydraulic machines, and has now a large and active plant in Aldene, N. J.

Associations and Societies

DIRECTORY OF AND REPORTS OF THE PROCEEDINGS OF THE METAL TRADES ORGANIZATIONS.

AMERICAN BRASS FOUNDERS' ASSOCIATION

President, L. W. Olson, Mansfield, Ohio; Secretary and Treasurer, W. M. Corse. All correspondence should be addressed to the Secretary, W. M. Corse, 46 Clarendon place, Buffalo, N. Y. The objects of the Association are for the educational welfare of the metal industry. Annual convention with the American Foundrymen's Association in a succession of cities as invited. The next convention will be held at Buffalo, N. Y., in September, 1912.

The February bulletin of the association contains the following:

The following changes in our constitution have been voted on favorably by a meeting of the Executive Board, held in Buffalo on January 11, 1912, and are hereby presented for approval. Kindly return the enclosed ballot at your earliest convenience.

ARTICLE 1.

Section 1. Which now reads: "The name of this association shall be the American Brass Founders' Association," to be changed to read: "The name of this association shall be the American Institute of Metals."

The Executive Committee have several reasons for recommending this change, the chief one being the following:

It has generally been conceded that the present name of the association does not adequately describe its scope and the difficulty of securing the interests of people not directly in the brass foundry business, such as professors of metallurgy at our various universities, is a real one. There are a number of people that would be glad to join our asociation, provided they felt its scope was broad enough to cover their particular line of work. It was with this idea in view that the change of name was recommended, as above stated.

ARTICLE 4.

Section 1. Which now reads: "This association shall meet in convention each year at the time and place that the annual convention of the American Foundrymen's Association is held," to be changed to read: "This association shall meet in convention each year at the time and place selected by the Executive Committee." The idea of this change is to obviate the difficulties that have come up during the present year, in the selection of a proper place of meeting. While we realize fully the value of meeting in connection with the American Foundrymen's Association and the Foundry Machine and Exhibition Company, it did not seem wise to our Executive Committee to be bound by our constitution to do this. Undoubtedly the present procedure will be followed out, but it seemed wise to allow a freedom of choice in making convention arrangements, which is not possible under the existing constitution.

The 1912 convention will be held in Buffalo, N. Y., in September. The exact date will be announced later, but it will probably be during the latter part of the month. This change in date is made at the request of the Local Committee of Buffalo and is due to the fact that the building in which the exhibition will be held will not be ready by June 1, due to the severe weather conditions during January and February.

The exhibition will open on Monday, which will give an opportunity for careful inspection on that day, if our members so desire.

Hotel Iroquois has been selected as headquarters for our association. The other associations have selected other hotels, so that it will be possible for all of our members to be together if they reserve their rooms well in advance. This feature is most desirable and is one that was lost sight of somewhat in Pittsburgh.

The regular rates which are to be held during the convention week are as follows:

EUROPEAN PLAN.

Room with running water, one person, $2 to $3; tub bath, one person, $3 to $5; shower bath, one person, $2.50 to $3.

Room with running water, two persons, $3 to $5; tub bath, two persons, $5 to $7; shower bath, two persons, $4 to $5.

For additional person, without bath, $1.50; with bath, $2.

It is strongly urged that you engage your room at this hotel as early as possible, so that all the members of our association may be together.

THE FOUNDRY AND MACHINE EXHIBITION COMPANY

President, H. R. Atwater, Cleveland, Ohio; Secretary, C. E. Hoyt, Lewis Institute, Chicago, Ill.; Treasurer, J. S. McCormick, J. S. McCormick Co., Pittsburgh, Pa. All correspondence should be addressed to the Secretary, C. E. Hoyt, Lewis Institute, Chicago, Ill. The objects of the Association are for the commercial and technical education of iron and metal industries by co-operating with all foundry and manufacturing interests in making an annual exhibit of supplies and equipments in connection with the meeting of the American Foundrymen's Association. The next exhibit and convention will be held at Buffalo, N. Y., in September, 1912.

The Executive Committee of the Foundry and Machine Exhibition Company after conferring with the Buffalo Committee have decided, owing to the fact that the repairs to the building, which has been selected for the convention, will not be completed before midsummer, that it would be unwise to plan to hold the convention and exhibition in the month of June. Therefore it has been suggested that the convention be deferred until September, probably the week of the 16th. The American Brass Founders' Association and the Associated Foundry Foremen have already agreed to hold their meeting in this month, and Secretary Moldenke of the American Foundrymen's Association is now taking a letter vote on this proposition and indications are that it will be accepted.

ELECTRO-PLATERS' ASSOCIATION

President, Charles H. Proctor, Arlington, N. J.; Treasurer, H. H. Reama, New York, N. Y.; Corresponding and Financial Secretary, Royal F. Clark; Recording Secretary, Edward Faint. All correspondence should be addressed to the Corresponding Secretary, Royal F. Clark, 246 Fulton avenue, Jersey City, N. J. This is an educational society, the objects of which are to promote the dissemination of knowledge concerning the art of electro-deposition of metals in all its branches. Meets at Grand Opera House Building, 309 W. 23d St., on the fourth Friday of each month, 8 p. m.

The regular monthly meeting of the association was held on February 23, with twenty-six members present. Prior to the

opening of the meeting an informal social hour was enjoyed. Three active members and one associate member were elected. The Indianapolis branch, which was formed on January 10, presented a petition asking for a charter, which was granted. The officers of this branch are: George Barrow, president; Frederick J. Neitzel, vice-president; B. D. Aufderheide, secretary-treasurer. A vote of thanks was extended to all the exhibitors at the annual banquet, and to the banquet and reception committees. A paper was then read by D. Schoonmaker on "The Electro-Deposition of Iron," which was followed by discussion on subjects of interest to the plater.

The regular monthly meeting of the Philadelphia branch was held at Dooner's Hotel, February 23. Three new members were elected and six applications received. Walter C. Gold read an interesting paper on the Cleaning of Anodes. Hugo Hermanns will speak on Brass Solutions at the March meeting. A vote of thanks was tendered to the Eureka Pneumatic Spray Company for the beautiful present to the branch.

The first open meeting of this branch was held at the Windsor Hotel on February 21, with forty guests present. After a few appropriate remarks by President Clements, Dr. W. A. Jones, of the Celluloid Zapon Company, spoke of the advantage which accrues to a plater by joining the association. Talks were also given by W. C. Gold, A. B. Wells, S. D. Benoliel and others. A social time followed, and it was unanimously agreed that the meeting was a success.

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS IN THE DIFFERENT INDUSTRIAL CENTERS OF THE WORLD.

WATERBURY, CONN.

MARCH 4, 1912.

Times are comparatively dull hereabouts in the metal industries, but there has been no rest for the manufacturers on account of the pending tariff bill, and many of them have been kept unusually busy, owing to the necessity of trips to Washington to attend hearings. There is much in this bill, which has passed the house, that the Naugatuck valley interests object to, as the reductions in metal schedules are very large in many instances. In a recent interview given out here W. E. Fulton, of the Farrel Foundry and Machine Company, pointed out that there is plenty of foreign competition in the machine tool business now, so much so, in fact, that his company found it difficult to compete with German and British concerns, which were able to bid lower, owing to the difference in cost of production due to labor's low price abroad. For instance, he said, his company could furnish work for 700 men if it had orders up to the capacity of the plant, but it is getting along with 500 and not working full time.

Practically all the brass interests hereabouts have been keenly interested in the progress of hearings, and they all have been represented by counsel. One of the industries which is most important hereabouts is pin manufacture, and if the tariffs in this bill are adopted, the manufacturers claim they will be hard hit, for nearly every product they make is scheduled for either a large reduction or the free list, although it is well known that there is plenty of foreign competition in the American market against them today. George A. Driggs, of the American Pin Company, is of the opinion, however, formed after several trips to the national capital, that the bill will not pass the senate. This view is shared by many of the other manufacturers, but should it pass the senate, they hope to exert influence enough to secure the president's veto of it.

Conditions are ordinary hereabouts. Five-day time prevails in nearly all the plants of Waterbury and Torrington, Winsted, Ansonia, Seymour and Derby. Orders are coming in jerky fashion, with marked indications of general hesitation in the market and about the time that a series of good-sized orders are filled there is a slump which prevents taking on a larger force of hands or increasing time. There is little pessimism, however, as the conditions are not far different from the average for election year.—F. B. F.

PROVIDENCE, R. I.

MARCH 4, 1912.

Business conditions in practically all of the metal industries are not so good at this time as a year ago, and there seems to be a somewhat pessimistic feeling, especially among the manufacturing jewelers and kindred lines. For many years there has been a generally accepted saying that the Presidential years are always off ones, and there are many who lean to this superstition at the present time. One thing is certain, while some of the jewelry firms are showing signs of improving business, the majority are only operating their plants on short time.

A two-alarm fire, which is believed to have started in some lacquer caused damage to the extent of $40,000 in the Washington Real Estate Company's building, 24 Calender street, on March 2. The entire roof and top floor of the four-story wooden structure were destroyed and the plants of four concerns in various branches of the manufacturing jewelry business were practically wiped out by the flames. The heaviest loss was in the establishment of A. Vester & Company, manufacturers of jewelers' findings, the damage caused largely by water being estimated to be $20,000. The other concerns which suffered were the Rowland & Whytock Company, A. L. Sterns & Company, Nicholas Palamides, Mrs. Anthony Heidt, Blacker Bros., Garvin Bros. & Murphy, Weinerman Bros., and Daniel Rosati.

Frederick F. Howard, formerly engaged with the Phillips Lead Supply Company of this city, has resigned to become associated with the Carpenter-Howard Company of North Attleboro, Mass. The latter concern has purchased the business formerly conducted by N. Perry & Company, dealers in jewelers' supplies, plumbing, heating and sheet metal work. Hoyle & Wightman, die and hub cutters, 43 Sabin street, has been succeeded by the Thomas Hoyle Company, Mr. Hoyle having purchased his partner's interest in the business. Mr. Wightman has started in a similar business at 59 Page street, under the name of T. H. Wightman & Company. H. J. Astle Company recently shipped to W. H. Slaventager Company, Inc., of New York, one of the largest sand blasts they have ever made. The O. R. Johnson Company is the name of a corporation that has been granted a charter under the laws of this State. The capital stock is $15,000, and the incorporators are Oscar R. Johnson, Thomas Curran and Robert T. Burbank, all of this city. The concern is to be located at Providence, and will engage in the manufacture and sale of all kinds of jewelry and other business incidental thereto.

The American Cornice Company of this city has been awarded the contract for the copper work of the Church of the Epiphany, this city. The firm has just completed the copper work on the Church of the Assumption on Potter avenue, this city, and the copper work on the St. Raymond church on North Main street. James H. Manning, Gardner M. Burgess and Archibald C. Matteson, all of this city, have been granted a charter under the name of the J. H. Manning Company. The concern is organized to engage in the business of manufacturing, buying, selling and dealing in jewelry, jewelers' findings, supplies and materials. It will be located in this city, with a capital stock fixed at $50,000.

There is considerable agitation in this city just at present over an effort to enact an amendment to the 56-hour-a-week law now upon the statute books, cutting the working time to 54 hours a week. The great argument in favor of the bill that has been urged has been that it would benefit women and children. But at a hearing upon the bill a few days ago an odd turn was taken when women suffragettes appeared against the bill. Their objection was that the act placed women on a par with children, whereas the advocates said women should be recognized as equal

to men and have a right to contract for their labor as they see fit. It was pointed out that the enactment of a 54-hour law would be very detrimental to several of the larger industries of this State, particularly the manufacturing jewelry. A number of manufacturing jewelers appeared in opposition to the bill. Louis Lyons, of the Lyons Manufacturing Company, said that women should be allowed to provide for their own hours of employment. There is nothing to keep the manufacturing jewelers in this State, he said, if the State is going to interfere with business. George H. Holmes opposed the bill on general grounds, and said that the jewelers would suffer greatly if the act was passed. William H. Waite spoke of the trouble the jewelers will have if the law is passed, and told of the competition with New York, where employees work sixty hours a week. William Nestor and Joseph Friel, two of the five men indicted by the grand jury several months ago on the charge of stealing two bricks of silver from the Elmwood plant of the Gorham Manufacturing Company on the afternoon of December 19, 1910, have just had their trial before a jury in Judge Baker's room at the Superior Court. Both were found guilty, but upon notification by counsel that he should apply for a new trial, sentence has been suspended and the men remanded to jail in default of $3,500 bail each.—W. H. M.

ATTLEBORO, MASS.

March 4, 1912.

The Fernald Company, capital $20,000, has been organized to manufacture triple-plated platinum jewelry here. Fernald Hutchins of Dedham, John J. Coady and David E. Fitzgerald of Attleboro, are the incorporators. An addition has been built to the front of the Finberg Manufacturing plant to contain the offices. The Bugbee & Niles Company has begun to move its machinery from North Attleboro to Providence, where it will hereafter be located. The Bristol Jewelry Company has been incorporated under the Rhode Island laws, with a capital stock of $100,000. Harold O. Bigney and Philip R. Cook of Attleboro, and James E. Pender of Providence, are the incorporators. Rep. W. A. Bellamy, of Taunton, is urging a jewelry and silverware school for this section of the county. Peter H. Levy, owner of a silver and brass foundry at Sag Harbor, L. I., is looking over Attleboro with a view of locating his plant here this spring.—C. W. D.

NEW BRITAIN, CONN.

March 4, 1912.

With two months of the year gone, New Britain manufacturers are very much pleased with business indications and with the advance orders already bagged. Every factory in the city engaged in the metal trades, with one possible exception, is running full time and with a complete force of employees. Large orders for immediate shipment are numerous, and advance orders are at hand in sufficiently large numbers to promise steady conditions for several months.

D. N. Camp, president of the Skinner Chuck Company, and one of the oldest of New Britain manufacturers in point of years, says, "We believe that the prospect for the future is hopeful. The revolutions in Turkey and China, while lessening importations from America for a time, will most assuredly in the end, as was the case in China, open up a new avenue for trade and produce a call for American products. We believe that legitimate business may look with hope on the future, and expect an enlargement of trade, commensurate with the increase in population, and the largely increased wealth of enlightened nations."

"In spite of disturbing elements, there has been a gradual and steady improvement in business conditions during the last half of 1911, and a careful investigation warrants the belief that 1912 will prove a fairly good year."—W. L. Humason, president of Humason & Beckley.

E. Allen Moore, of the Stanley Works, says, "All the material conditions are right for good business in the year 1912. Money is comparatively easy to command for the legitimate demands of trade, and the crops raised during 1911, upon the sale of which depends, to a considerable degree, the purchasing power of the country, were good, although not exceptional, and are commanding good prices."

"Speaking from the standpoint of our own business, we are looking for an enlarged output during 1912. The business outlook is thought to be much better than generally supposed. Of course, congress and political uncertainties may change the present feeling, but we believe prospects are generally brightening."—H. C. Hine, president Traut & Hine.

Traut & Hine furnished attractive safety razors, one of their products, as souvenirs at a recent banquet of the New Britain Business Men's Association.

With the annual meeting, held a week ago, the American Hardware Corporation formally opened its new executive office building for the use of the concern's officials. The new building is a remodeled mansion in colonial style situated near the factory, and is occupied by the offices of the president, vice-president, purchasing agent, treasurer and auditor. The election of officers of this corporation, the largest in the city, follows: President, C. M. Jarvis; first vice-president, Charles H. Parsons; vice-presidents, Charles Glover, Benjamin A. Hawley, Carlisle H. Baldwin; treasurer, Charles E. Wetmore; assistant treasurer, Isaac D. Russell; secretary, Andrew J. Sloper; assistant secretary, Charles B. Parsons. Isaac D. Russell is at present in Washington looking after the interests of New Britain manufacturers in matters pertaining to tariff. The P. & F. Corbin Foremen's club held its annual banquet a fortnight ago, and a gala occasion was reported by those present. Officials of the company were in attendance with the exception of Charles M. Jarvis, who was kept away by illness.

Charles F. Smith, president of Landers, Frary & Clark, has returned to New Britain after a business trip to England. At the annual meeting of the New Britain Machine Company officers were elected as follows: President, F. G. Platt; secretary, R. S. Brown; treasurer, H. H. Pease; assistant secretary, H. E. Erwin; assistant treasurer and superintendent, A. Buol. Quotations on stock in New Britain industries are somewhat higher than a few months ago. Some of the more important ones follow: American Hardware, 134; Stanley Rule & Level, 325; New Britain Machine, 63; Landers, Frary & Clark, 94½; Stanley Works, 54½; Union Manufacturing Company, 52½.—A. L. M.

NEWARK, N. J.

March 4, 1912.

The manufacturing jewelers and silversmiths have been starting the year pretty well, being fairly busy, selling to the jobbing trades. The demand, however, among the retailers has been a little quiet so far, very conservative buying, but no doubt as the season progresses the trade will continue to improve. It is bound to, as it cannot go any lower. The trade has struck rock bottom during the past four years and a change is due for the better.

In order to help direct buying in the various lines, the Board of Trade are promoting a project to hold in March an exhibition of all Newark made goods, which will bring to this city over 1,000 buyers. This will apply to all lines of manufactures, and previously most of these buyers have gone to New York City to make their purchases. During the past four years many firms in several lines have given up their New York offices, conducting all the selling direct from the factory. Curtis R. Burnett, as president of the Board of Trade, is actively interested in this exhibition.

Croselmire and Ackar, gold, silver and platinum refiners, sold their plant to the American Platinum Company. The firm went in business nine years ago and C. Eisenach, the head of the firm retiring, has gone on a trip to Europe. Henry Bender, who had charge of the melting department of the above firm, has started in business for himself at the same address, 42 Walnut street, and has installed a full equipment for the refining of gold, silver and platinum.

E. A. Whitehouse and the George H. Le Compte Manufacturing Company, making harness and carriage specialties, have gone more into the making of automobile parts and are doing more business than ever. The Aluminum and Metal Specialty Company, of Oliver street, have their wire sample lines on the market, some new ones are a tobacco jar, toilet fixtures and household goods. They have made a great success in making special articles and have enlarged their plant to double the size during the last few months, and further additions will be made later.

B. Conlan & Company, making metal goods, have put up a new building and have much larger facilities. They are now

confining their attention mostly to cheap belt buckles, of brass, plated with any finish. The Lippincott Steam Specialty Supply Company, of the Richardson building, separated some time ago from the Alcohol Utensil Manufacturing Company, both being separate now. The Lippincott Company makes indicators, pyrometers, reducing wheels, line water motors for household use and plumbing goods.

Hanson & Van Winkle Company have erected a new foundry building, added to the general factory plant and purchased the plant of the Newark Chemical Company, as well as the good will of the business. The latter firm made lacquers, which the Hanson and Van Winkle Company have also been engaged in. This concern are turning out the highest grade of lacquers and their new catalog is ready to be sent out.

The American Square Tube Company, of North Third street, William Finnegan, manager, have opened another plant at 251 Railroad avenue, making tubing for beds, of steel, brass plated. A plating plant has been installed.—H. S.

MERIDEN CONN.

March 4, 1912.

Business in Meriden at the present is fully as good as it was last year at the same time. True, some few of the factories are running short time, but for the most part they are running full time, and the prospects are favorable for a good year's business. The International Silver Company have recently been given what is believed to be the largest single order for hotel silverware that was ever placed. This ware is for the new McAlpin Hotel, Broadway and 34th street, New York City. The contract calls for over $100,000 worth of silverware to be finished and shipped by December 1. This order was secured by I. B. Beach, manager of the hotel department of this company, and calls for an exclusive design to be used only for this order.

The recently completed Industrial Building on Vine street is giving manufacturers with small capital an opportunity they have heretofore lacked, and it is expected that many who have wanted such a place will take advantage of the opportunities it offers. Already a part of the building is occupied by three firms. The C. G. Armstrong Manufacturing Company have installed machinery and have already begun to fill orders. They are making a line of jewelry novelties. The Brown & Dowd Manufacturing Company are manufacturing a line of household hardware, and are doing an excellent business. H. W. Stowe, another occupant of the building, is manufacturing power pneumatics for player pianos, and reports that he has a large number of orders.

The Connecticut Telephone & Supply Company is one of the few factories running overtime. This company have large orders for automobile supplies, and in order to fill them on time have been compelled to run part of their plant until 9 o'clock nights. The J. D. Bergen Company, manufacturers of cut glass ware, have been offered inducements to move to another city. We trust, however, that they will decide to remain here, for Meriden can ill afford to lose any of its manufacturers. The threatened increase of the factory tax lists will, if put into effect, undoubtedly have a tendency to discourage any who may have contemplated making additions to their plants, but we hope that this will only be temporary, and that the matter will be settled satisfactorily to all concerned.—F. O. V.

CLEVELAND, OHIO

March 4, 1912.

One of the interesting things in Cleveland during the past month to those engaged in the metal industry was the big automobile show at which a wealth of new contrivances as well as old ones was shown. Cleveland stands second in the automobile industry, and large quantities of aluminum, brass, copper and other metals are consumed annually in the manufacture of the thousands of cars turned out from this city. The grade of metal work used in automobile manufacture is constantly improving, making the cars more durable as well as lighter and swifter. Some splendid samples of plated work were shown in connection with some of the cars which were on exhibition. The feeling in the automobile industry is that this is going to be a splendid year for business, and that the twelve or thirteen factories located here will be kept humming throughout the year.

With a bitterly cold winter drawing to a close, manufacturers of house plumbing fixtures are getting ready for the annual spring and summer rush coincident with the erection of new buildings. Manufacturers of plumbing fixtures here say that the business outlook is exceptionally bright and that there is no reason to doubt but that the present year will excel all others. During the past month the Cleveland Metal Products Company, having in mind an extension of its manufacturing plant on Ivanhoe Road, Collinwood, increased the capitalization of the company from $200,000 to $1,000,000. The plant at present consists of three brick buildings on a sixteen-acre tract of land in Collinwood. The company was formed in September, 1910, actual operations beginning about eight months ago. F. W. Randsey is president of the company, and the directors include A. T. Hills, G. R. Collar, E. A. Dodd, Edwin Heina.

Another evidence of prosperity in the metal business has been the increase in capital of the Doylestown Aluminum Company, of Doylestown, Ohio, from $10,000 to $25,000. The company is preparing to enlarge its capacity for turning out aluminum ware.

What is said to be one of the largest silver contracts ever given to one firm of jewelers and silversmiths in the history of the hotel business in this country was closed during the past month, when E. M. Statler awarded to Reed & Barton of New York a contract for $40,000 worth of silver for the new Statler Hotel in process of construction here. The new building will be opened the latter part of this year and will be the finest hotel between New York and Chicago. It is twelve stories high, contains seven hundred rooms with baths, and will cost about $2,500,000 when completed.—S. L. McM.

DETROIT, MICH.

March 4, 1912.

With the approach of the warmer months every line of the brass and aluminum business in Detroit is taking on new vim and the prospects for a good season and an early one, at that, was never better than it is today. The building trades, where come the demand for plumbing and other supplies manufactured from brass and aluminum, show a decided advancement. Manufacturers express confidence in the future and are operating accordingly. A number of brass industries during the past winter have made improvements and otherwise increased the capacity of their plants to such an extent that they are well fortified for any heavy business that may come their way. New men are being taken on in many instances, and everything looks good for a prosperous season.

Two rather serious conditions threaten brass manufacturers at the present time—the shortage of coal and also of cars by which to move manufactured products. Factories in every line of trade in Detroit during the last month have been on the ragged edge, so far as fuel is concerned. At times many had barely sufficient to carry them from day to day, but through strenuous appeals to the railroads they have thus far been able to operate. Thousands of cars of coal are even now tied up in the freight yards in Toledo, seventy miles away, and it is like pulling teeth to keep the stuff moving. The trouble is largely due to the cold weather and inability of the railroads to obtain locomotives with which to move the cars. Where one locomotive is able to haul 100 cars in warm weather, it is only able to handle 50 under conditions such as have prevailed in Detroit and vicinity during the last six weeks. Automobile dealers have also been sorely hit. While being unable to obtain coal they also have been handicapped in obtaining cars for shipping machines. Orders for 1912 are coming in fast now, and it means much to them when prompt shipments cannot be made. One automobile company a few days ago was forced to ship a consignment of machines to Boston by way of Montreal, something that has never been known here before. It was simply impossible to obtain cars on the American side, and the Canadian line which did the hauling refused to allow its cars to leave the line, so urgent is the demand for them in the Dominion. It is expected these conditions will disappear when warmer weather prevails, although no one really is positive, even then, that relief from the disagreeable situation will be obtained.—F. J. H.

TRADE NEWS

TRADE NEWS OF INTEREST DESIRED FROM ALL OF OUR READERS. ADDRESS THE METAL INDUSTRY, 99 JOHN STREET, NEW YORK

ADDITIONAL TRADE NEWS WILL BE FOUND UNDER "CORRESPONDENCE."

The American Silver Company, Bristol, Conn., is planning to erect a two story factory building 30 by 50 feet.

The current trade press reports that the C. O. Blark Brass Company, of Montreal, Canada, will equip a new brass foundry.

Lassman & Devinsky, electro-platers and polishers on gold and silver and colorers on fine jewelry, have recently started in business at 62 Bowery, New York.

The International Smelting & Refining Company, New York, announce through J. W. Allen, treasurer, that they have decided to locate their lead refinery at East Chicago, Ind.

The Fort Wayne Electric Works, Fort Wayne, Ind., report through E. A. Barnes, superintendent, that they are doubling the size of their works and making a general rearrangement.

The Gorham Manufacturing Company, Providence, R. I., have recently cast a bronze standing statue of heroic proportions of George Washington, which has been shipped to Buenos Aires, Argentina.

The Prest-O-Lite Company, Indianapolis, Ind., report that they expect to open a charging station in Merritton, Ont., about May 1. This is to enable them to give better service to the automobile owners and dealers in Canada.

The Eagle Smelting & Refining Works, 734-740 E. 14th street, New York, have opened a warehouse at the Bush Terminal Building, Brooklyn. The company state that they do not intend to discontinue their Manhattan office.

Charles M. Kruger has recently started a factory for the manufacture of the National Vacuum Cleaner at St. Louis, Mo. In addition to this Mr. Kruger states that he is now in a position to do job work in brass castings. The plant now employs ten men.

It is reported that the Gas Fixture & Brass Company of Cleveland, Ohio, have purchased the entire plant of the United Brass Manufacturing Company, and that they will install new machinery for the making of gas fixtures and will also purchase plumbers' brass supplies.

The R. & M. Pattern & Metal Company, Topeka, Kan., report through R. A. Ridings, manager, that their new model and pattern shops are running in fine shape. Work has also been started in the foundry and it is expected that this department will be running full blast in the near future.

The Columbia Brass Works, Los Angeles, Cal., manufacturers of brass, bronze and aluminum castings, who have been in their new foundry since the first of the year, report, through George A. Reed, proprietor, that business is very good and that the brass business in the West is steadily growing.

The Hawley Down Draft Furnace Company, manufacturers of and installers of systems of smokeless combustion and of Schwartz melting furnaces, Chicago, Ill., have issued a folder adorned with a picture of their comprehensive new plant now nearing completion at Easton, Pa.

It is reported that the Yale & Towne Manufacturing Company of Stamford, Conn., have arranged with John Downey to erect at 9-11 East Forty-second street, New York, a twelve-story building for the exclusive use of the company. The building will occupy a lot about 50 by 100 feet.

The Duplex Metals Company, manufacturers of copper-clad steel wire, Chester, Pa., have recently installed a plate mill and are now prepared to turn out copper-clad steel sheets, strips, plates and small structural shapes, in addition to nails and staples of all kinds and sizes. The New York office of this company has been discontinued.

The D. H. Stoll Company, manufacturers of presses, dies and special machinery for forming sheet metal, Buffalo, N. Y., have recently completed contracts for the entire equipment of three large plants in the South, one in Colorado, two in Canada, in addition to miscellaneous equipment furnished to several large plants in this country.

At Pittsburgh, Pa., the Industrial Commission will spend $200,000 in bringing new industries to that city. Some large manufacturing jewelers are particularly desired, and the metal trades also. Pittsburgh will be boomed from Maine to California, and the proposition is backed by the Chamber of Commerce and all civic organizations.

The following bids will open April 9. At the navy yard, Brooklyn, N. Y.—Sch. 4414, sulphuric acid; Sch. 4415, copper nails, brass machine screws. At the navy yard, Washington, D. C.—Sch. 4409, drawn brass tubes; flexible copper tubing; brass and copper tubing; brass, round, drawn; bronze, round naval; copper, sheets; nickel; zinc, ingot.

The Platinide Company, Melrose Highlands, Mass., manufacturers of "Platinide," a substitute for platinum, and other special alloys for commercial and scientific purposes, have appointed Underwood & Romain, Room 4009, 1 Madison avenue, New York, their sales agents. Inquiries to either the home or New York office will receive prompt attention.

The Penn Foundry & Mfg. Company, Inc., Basic City, Iowa, announce that they are equipping their plant with a first-class foundry and machine shop and will be prepared to furnish castings of various kinds, and will also manufacture Champion gas and gasoline engines and saws, the rights, patterns and privileges to manufacture of which they have recently purchased.

Bruce & Cook, metal dealers, 190 Water street, New York, are celebrating the one hundredth anniversary of the founding of the firm in 1812 by John M. Bruce, Sr. In commemoration of this event the firm have issued a handsome pamphlet, illustrated with handsome photo-engravures of the founder and various members of the company. The pamphlet also contains an historical sketch outlining the growth of the firm's business.

The International Silver Company, Meriden, Conn., has declared an additional dividend of one per cent. on the seven per cent. cumulative preferred issue, which is beyond the regular quarterly disbursement of 1¾ per cent. and the one-quarter of one per cent. extra which has been paid each quarter on account of back dividends since April, 1911. The extra dividend is payable May 15, to stockholders of record May 1.

The Jonathan Bartley Crucible Company, at Trenton, N. J., say that a No. 70 crucible ran 97 heats in a brass foundry, using chloride of zinc for a flux, the usual run being 30 to 40. A No. 125 crucible has had 87 charges and is still going. This firm is using the highest grade of German clay and plumbago and is having quite a demand from the manufacturing jewelers. As to foreign business a branch is being opened in South America.

The following officers were elected at the annual meeting of the Bristol Brass Company and the American Silver Company:

The Bristol Company; president, Albert F. Rockwell; vice-president, Deane Welch; secretary and treasurer, J. R. Holly. The American Silver Company: president, A. F. Rockwell; vice-president, P. N. Welch; treasurer, J. R. Holly; secretary and assistant treasurer, Samuel B. Harper. The directors of these companies are the officers, and R. S. Newell, C. T. Treadway, and C. W. Gross.

The United States McAdamite Company, Brooklyn, N. Y., have purchased property in Detroit and will establish a plant there. At present there are two large frame buildings on the site, each 50 by 100 feet, in addition to a two-story office building. The company will erect a complete, modern, up-to-date building, 90 by 150 feet, and expect to have the plant in operation by April 1. Castings of McAdamite, a strong white metal with an aluminum base, will be manufactured in the plant which will furnish employment for from 100 to 200 men.

Richards & Company, Boston, Mass., who have been selling metals for one hundred years, are now also selling a limited number of foundry supplies. They deal in riddles, shovels and crucibles, besides every metal that the brass founder needs. They also have an aluminum solder of their own which is useful in mending aluminum castings. Besides they make ingot brass to any specification or analysis. Their office, store and warehouse is at 200 Causeway street, which is headquarters for everything in the line of metals, they have besides a smelting plant located in another part of the city.

The Codd Tank and Specialty Company, 406 W. Camden street, Baltimore, Md., by William C. Codd, president, announce that they own the manufacturers' rights of the Busey Babbitt Melter for melting babbitt-lead, solder and similar metals in shops and factories. It is claimed for this melter that it is safer and more convenient than other melters. The fuel used in the Busey melter is gas, which is mixed constantly and thoroughly with a warm draft of air by means of a Busey warm draft burner as it passes through the burner tube. Further particulars on application.

The annual exhibit of the work of the evening classes in Pratt Institute, Brooklyn, N. Y., will be held on Friday evening, March 22, from eight to ten o'clock, and is open to the public. The institute offers courses for both men and women in drawing and design, applied art, applied science, sewing, dressmaking, millinery, household arts and various mechanical trades, and this exhibit affords visitors an opportunity not only of viewing the work of the students in the various courses, but also of inspecting both the results and methods, as well as the equipment and general facilities of the school for conducting this kind of industrial training.

"The Joseph Dixon Crucible Company of Jersey City has just put on the market a new chain graphite, especially intended for lubricating the chains of motor trucks and pleasure cars. This preparation is put up in sticks, cylindrical shape, 2 ins. x 8 ins., encased in a neat cardboard carton and weighing about one pound each. It is made of the same material as the Dixon bicycle stick graphite with which every bicycle owner is familiar. It is by far the most convenient chain lubricant on the market, for a bar may be carried on the car ready for use at any time. To apply, it is simply necessary to rub the bar against the side of the chain. The "big stick" makes it easy to keep automobile driving chains in first-class condition. Unlike oils and greases, it will not collect dust and dirt."

The American Tool & Machine Company, Boston, Mass., recently shipped three of their turret lathes to Russia and three to Brazil. They send their turret lathe tools all over the world, having installed them in such out of the way places as New Zealand and other islands of the south seas. The company also sends out sugar machinery to the sugar producing countries of the world. Occasionally the company will trace the origin of an unsolicited order, from some corner of the world; and they have frequently found that it is due to the fact that some mechanic has become a master mechanic and having used the American Tool & Machine Company's turret lathes, knows what he can do with them, and when he is in charge of a shop, no matter where, he remembers to send an order for this company's tools.

The Vulcan Engineering Sales Company, with offices in the Fisher building, Chicago, and at 30 Church street, New York, has been organized to control and sell the entire output of the Hanna Engineering Works, manufacturers of foundry supplies, Chicago; the Mumford Molding Machine Company, manufacturers of molding machines, Plainfield, N. J., and the Q. M. S. Company, manufacturers of metal saws, cranes, etc., New York. The officers of the Vulcan Company are: President, H. K. Gilbert, formerly vice-president of the Buda Company, Harvey, Ill.; P. W. Gates, secretary and treasurer, president of the Hanna Engineering Company. E. H. Mumford, vice-president and general manager of the Mumford Molding Machine Company, will continue in charge of the manufacturing in that department.

Proposals will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until 10 o'clock a. m., March 26, 1912, and publicly opened immediately thereafter, to furnish at the navy yard, Brooklyn, N. Y., etc., a quantity of naval supplies, as follows: Sch. 4375: Naval brass, sheet brass, phosphor-bronze, bar, ingot and sheet copper.—Sch. 4376, brass and copper pipe.—Sch. 4377, brass cocks, brass pipe fittings and unions.—Sch. 4380, copper nails, brass bolts, etc.—Sch. 4381, brass voice tubing, copper sheathing.—Sch. 4382, phosphor bronze wire, copper wire. At the navy yard, Washington, D. C.: Sch. 4374, brass nuts.—Sch. 4375, rod and sheet brass, sheet phosphor-bronze, rod, ingot, and sheet copper.—Sch. 4376, brass and copper pipe, condenser tubes.—Sch. 4377, composition cocks and pipe fittings.—Sch. 4381, copper sheathing, naval bronze, brass voice tubing.—Sch. 4382, phosphor-bronze wire, copper wire. At the navy yard, Norfolk, Va., Sch. 4381, bronze rivet rod. At the navy yard, Portsmouth, N. H., Sch. 4380, copper discs.—Sch. 4389, brass voice tubing. At the navy yard, Philadelphia, Pa., Sch. 4389, sheet lead, lead pipe.—Sch. 4394, copper funnels. At the naval torpedo station, Newport, R. I., Sch. 4397, ingot tin, phosphor tin, ingot zinc, brass tubing, ingot copper, brass rod.

FOREIGN TRADE OPPORTUNITIES

No. 8046. Various metal work.—The War Office, Bucharest, Roumania, will receive tenders for 328,040 kilos steel for shrapnels, 58,530 kilos brass bars (Delta), 771 kilos brass wire, 1,104 kilos brass sheets and tape, 7,695 kilos copper tubes and rings, 92,000 kilos lead for bullets, 1,000 kilos ditto tape, 15,800 kilos antimony. Particulars, specifications, and conditions may be obtained from the "Ministère de la Guerre," War Office, Bucharest, Roumania.

No. 8047. Various metal work.—The War Office, Roumania, invites tenders for 25,220 kilos and 715 kilos sheet steel, 17,135 kilos sheet iron, 116,280 kilos various iron, 290 brass tubes (95 millimeters long, 22-20 millimeters No. 0), 2,900 brass rivets, No. 0, 759 packets iron screws, nuts, etc. A deposit of 10 per cent. of the value of the contract will be required. Particulars, specifications, and conditions may be obtained from the "Ministère de la Guerre," War Office, Bucharest, Roumania.

No. 8005. Jewelry, silverware, and cutlery.—A business firm in the Far East writes to the Bureau of Manufactures that a good trade can be built up in certain lines in that region, and the firm would be glad to hear from American manufacturers of all kinds of watches to retail at not over $10 each, watch chains, charms, fobs, rings, jewelry of cheap varieties, silver-plated butter dishes, casters, cruets, trays, cheap quality forks, knives, spoons, small dinner sets in cases, combination sets, butcher and kitchen knives, pocket knives, scissors, razors, etc.

[In applying for addresses at Bureau of Manufacturers, Washington, D. C., refer to file number.]

REMOVALS

Woltag & Weitze, platers and colorers, have moved from 132 Hester street, New York, to 7 Eldridge street.

The offices of the Uraniumite Company of America has been moved from 69 Main street to 609 Main street, Buffalo, N. Y.

The Aluminum Cooking Utensil Company, a subsidiary of the Aluminum Company of America, have moved their New York office from 99 John street to the Marbridge building, Broadway and 34th street.

The offices of the Ansonia Brass & Copper Branch of The American Brass Company will be moved on May 1 to their new building in Ansonia, Conn., from the third floor of the Phelps-Dodge building, 99 John street, New York. The present offices of the Ansonia branch will be occupied by the Benedict & Burnham branch of the American Brass Company, who are now on the first floor of this building.

FIRES

Fire in the plant of the National Manufacturing Company, manufacturers of brass and plumbers' supplies, Minneapolis, Minn., caused a loss of about $150,000.

The plant of the Canton Brass & Machine Company, Canton, Ohio, was destroyed by fire on the night of February 22, causing a direct loss of $5,000. L. E. Shull, secretary, reports that the company has secured temporary quarters and are in a position to take care of their trade until such time as they can rebuild, which they expect to do as promptly as possible.

The Hauck Manufacturing Company, Livingston street, Brooklyn, N. Y., suffered a fire on the night of March 5, which destroyed the office and did some damage to the factory. The company states that they will refit the premises and continue their business of manufacturing oil burning appliances, ladle heaters, core ovens and furnace burners, mold dryers, brazing outfits, etc.

BUSINESS TROUBLES

Bernard J. MacCorry has been appointed, by Judge Hand, receiver for the Continental Art Glass & Brass Company, 22 Howard street, New York.

At a meeting of the creditors of Paul S. Reeves & Son, Philadelphia, Pa., held February 20, Clarence B. White was selected trustee, and was authorized to continue the business for a period not exceeding 30 days, pending negotiations for the sale of the entire plant as a going concern to parties interested.

INCREASE OF CAPITAL STOCK

The capital stock of The Doylestown Aluminum Ware Company, Doylestown, Ohio, has been increased from $10,000 to $25,000.

The Bridgeport Brass Company, Bridgeport, Conn., have added the sum of $100,000 to their capital stock, which now totals $1,100,000.

The Norwalk Foundry Company, formerly the Norwalk Iron & Brass Company, Norwalk, Ohio, has increased its capital stock from $10,000 to $25,000.

INCORPORATIONS

Business organizations incorporated recently. In addressing them it is advisable to include also the names of the incorporators and their residence. Particulars of additional incorporations may frequently be found in the "Correspondence" columns.

Boston Brass Company, Boston, Mass. Capital stock, $20,000. To deal in brass and other metals. Incorporators: George F. Hickmott, Jesse Y. Baker, both of 36 Oliver street, Boston.

The Indiana Brass Company, Frankfort, Ind. Capital stock, $10,000. To manufacture brass goods. Incorporators: J. A. Johnson, A. J. Johnson and C. Williams, all of Frankfort.

The Newark Art Foundry Company, Newark, N. J. Capital stock, $10,000. To manufacture jewelry. Incorporators: Ernest Vatier, Louis Heck, William Arthur and James Metcalf, all of Newark.

The Atlas Specialty Manufacturing Company, Chicago. Capital stock, $10,000. To manufacture metal specialties. Incorporators: Cæsar J. Woldham, John E. McAuley and Howard F. Leopold, all of Chicago.

J. B. Wise, Inc., Watertown, N. Y. Capital stock, $400,000. To manufacture furnaces, machinery and plumbers' supplies. Directors: James B. Wise, Hattie C. Wise, Charles R. Wise and Lucien Mitchell, all of Watertown.

The National Metalizing Company, Garwood, N. J. Capital, $250,000. To manufacture metals and metallic compounds. Incorporators: R. W. France, F. S. Viele, C. J. Kulberg, J. P. Thorne and L. A. Watson, all of Garwood.

Clarksburg Zinc Company, Northview, W. Va. Capital stock, $5,000. To manufacture zinc and other products. Incorporators: G. F. Hoffheimer, L. S. Hoffheimer, C. J. Lippmann, W. V. Kish and C. B. Johnson, all of Clarksburg.

PRINTED MATTER

Shearardizing: A complete description of sherardizing and its many advantages, together with reports from various satisfied users, is given in a new catalogue published by the United States Sherardizing Company, New Castle, Pa. Copies of the book will be sent upon request.

Statistical Review: The annual statistical report of the New York Metal Exchange, compiled by C. Mayer, secretary, has been issued for 1911. This report gives the prices of metals, domestic and foreign markets, for the past year, and also contains the movements of tin for the past fifteen years.

Soldering Fluxes.—The Grasselli Chemical Company, of New York and Cleveland, issue a small folder giving directions for the use of "Crystal Eureka" soldering flux for soldering galvanized iron. This flux is being used by many concerns for soldering by simply adding a little free muriatic acid. Further information upon request.

Chemicals and Supplies.—The Henry Heil Chemical Company, St. Louis, Mo., have issued a series of pamphlets and letters of testimonial relating to the various lines of chemicals and supplies imported and sold by them. These include crucibles, scorifiers, muffles, filter paper, balances and weights, and other apparatus for chemical and physical laboratories.

Presses.—A 154-page catalog with fine half-tone engravings is issued by the D. H. Stoll Company, Buffalo, N. Y., manufacturers of presses, punch shears, dies and special machines for working sheet metal. This book is the twelfth edition and gives a full description with illustrations of the extensive line of metal working machinery manufactured by this company. Copies upon request.

Refractometer: A description of the Féry refractometer is issued by Adam Hilger, 75a Camden road, London, N. W., England. The object of the Féry refractometer is for the determination of the refractive index for sodium light of oils; solutions of acids; mixtures of glycerine, alcohols, etc., with water; sugar solutions; and other liquids of interest to the industrial chemist. Additional information may be obtained by corresponding with the above firm.

Welding: The Toledo Electric Welder Company, Cincinnati, Ohio, have issued Bulletin No. 11 on butt welding. This bulletin consists of 35 pages and gives complete descriptions and illustrations of the various types of electric welders manufactured by this company. A complete explanation is also included as to the difference between ordinary and electric welding and the different methods of electric welding are thoroughly explained. Copies of the catalog will be sent upon request.

Automatic Screw Slotters: The Waterbury Farrell Foundry and Machinery Company, Waterbury, Conn., describe their line of automatic screw slotters in a six-page folder just issued.

These slotters, it is claimed, embody many new and valuable features that have been carefully studied and tested out. They are so constructed that the maximum length of time possible is given to the sawing, and the minimum time for handling the work to and from the sawing position. Further information upon request.

POLISHING WHEELS.—The Springfield Tire & Rubber Company, Springfield, Ohio, give directions in a small 20-page booklet, just issued, for the use of Springfield abrasive polishing wheels and blocks. It is stated that these wheels and blocks have been thoroughly tested and tried out by some of the largest manufacturers and reported to be a positive success and far superior to anything previously used for polishing. Copies of the booklet, together with full information regarding these wheels will be furnished upon application.

DYNAMOS.—An attractive catalogue recently issued by the Munning-Loeb Company, of Matawan, N. J., contains a complete description of their Optimus plating dynamo. Two and three wire dynamos are illustrated and described, as are also their belt and direct connected motor driven units. The value of compound wound plating dynamo is discussed, and it is pointed out why these dynamos maintain a uniform voltage at from zero to 25 per cent. overload and at the same time eliminate all sparking at the brushes. Test curves showing the performance are included and several pages in the back of the catalogues give interesting data of value to electro platers. Copies of this bulletin may be had by addressing the Munning-Loeb Company, at Matawan, N. J.

CATALOG EXHIBIT

An exhibition of every kind of catalog may be seen at THE METAL INDUSTRY office, 99 John street, New York. THE METAL INDUSTRY is prepared to do all of the work necessary for the making of catalogs, pamphlets, circulars and other printed matter. Estimates will be furnished for writing descriptions, making engravings, printing, binding, for the entire job from beginning to end or any part of it.

AD NEWS

The Standard Rolling Mills, Inc., 363 Hudson avenue, Brooklyn, N. Y., request opportunities for quoting on metal spinnings of all kinds.

The Williamsville Buff Manufacturing Company, Danielson, Conn., suggest the advantages of buying buffs direct from the manufacturers. This company's plant is engaged exclusively in manufacturing buffs.

The Cleveland Platers' Supply Company, Cleveland, Ohio, offer to send, without obligation or expense, their latest fourteen-page treatise on Electric Cleaning to interested persons who fill out and mail the coupon published in their advertisement.

Charles Cooper Company, 194 Worth street, New York, N. Y., one of the best known chemical houses in the country, having been established in 1857, are advertising their full line of chemicals. Platers and manufacturers who are not already in touch with them will do well to send for their price list.

Albany Molding Sand is again featured on the front cover. This product of the Albany Sand & Supply Company is used in the leading brass foundries throughout the country. Their sand banks are now being opened up for the season and foundrymen are invited to secure quotations on the year's requirements.

W. W. Wells, 368 Victoria street, Toronto, Canada, advertises that he is the only Canadian manufacturer of high grade nickel anodes made of pure Canadian grain nickel. This firm also makes buffs and polishing wheels, furnishes all kinds of plating supplies, installs complete outfits and guarantees satisfaction.

The Waterbury Metal Products Company desires inquiries from persons wanting sheet metal goods manufactured. They are equipped to do drilling, stamping and turning. They desire orders for tool making and are prepared to make especially good terms on jobbing or contracting work in the plating and polishing lines.

The No-Dust Drying Machine Company, 40 Clifford street, Providence, R. I., are advertising in this issue their modern equipment for drying metals of all kinds. This company manufactures drying machines that are of particular interest to jewelry manufacturers, platers and others who handle metal goods for plating, etc.

INQUIRIES AND OPPORTUNITIES

Under our directory of "Trade Wants" (published each month in the rear advertising pages), will be found a number of inquiries and opportunities which, if followed up, are a means of securing business. Our "Trade Want Directory" fills wants of all kinds, assists in the buying and selling of metals, machinery, foundry and platers' supplies, procures positions and secures capable assistants. See Want Ad. pages.

THE NEW YORK METAL EXCHANGE

BY J. J. ARCHER.

There is a movement on foot by the members of the Metal Exchange to broaden and extend trading in pig tin in this market. New rules have been adopted and it is hoped the larger consumers of the country will make their purchases on the floor of the Exchange and so secure their supplies at the ruling market prices as established at the daily call.

At present American consumers and the New York traders are at the mercy of the London speculators, as all of the Straits tin now coming to this market is bought in London. It is proposed for the Metal Exchange to have daily cables from the Eastern tin market so that traders can be kept in touch with the producers of the metal and by this means eliminate the London speculators. It is pointed out that with the Panama Canal open, the Eastern tin market can land tin in New York inside of thirty days instead of the 42 or more days now required. The saving of interest alone will be quite an item and the profits that are now paid to the London speculators will be a very considerable saving to all consumers of the metal in this country.

METAL MARKET REVIEW

NEW YORK, March 11, 1912.

COPPER.

The strength of the last two months in the copper market has been maintained in the face of dull trade during the entire month under review and prices of all grades are from ¼ to ⅜ of a cent per pound higher.

There has been no general buying movement from the class of consumers taking from, say, 25-ton to 100-ton lots, and this buying is the best and most reliable criterion of a legitimate demand for copper. With this demand absolutely lacking during the entire month we are told from Wall Street that sales have been made within the last few days to consumers of from 20,000,000 to 30,000,000 pounds. To the real copper trade, outside of Wall Street, these "Wall Street sales," as matters of fact, do not amount to a row of beans.

There was a very active buying movement during December and early January and consumers pretty well covered themselves well into March, with the late halt in trade that started late in January and was very pronounced during the whole of February, many consumers considerably overbought and it is only reasonable and natural that the copper market should be more or less dull during February.

The strength and advances in copper during the month have been engineered entirely through the speculative standard market in London, and the heavy exports. Whether these exports have all gone into consumption is very doubtful.

Statistically, copper appears to be in a remarkably strong position. The Copper Producers' Association showed a decrease for the month of January of over 23,000,000 pounds, the

European statistics published March 1 show a decrease of 4,070 tons during the month of February, and compared with a year ago these European stocks have decreased 30,880 tons. It is to be noted that the exports to France since November last have been very heavy, and according to these same foreign statistics the stocks of copper in France since that date have varied very slightly. The average monthly exports to France for last year were 4,485 tons. Since November, 1911, the exports to France to end of February were 27,500 tons, or an average for these last three months of over 9,000 tons against an average during 1911 of 4,485 tons. These excess shipments to France do not show in the stocks, and it has been suggested that these stocks have been accumulated for trading purposes in the new metal exchange established at Havre, and that this copper can be classed as "consumed." It may be so, but it looks very much like manipulation.

The market during the month has been very dull, but very firm, Lake closing at around 14.65, Electrolytic 14½ and casting brands at 14.40.

TIN.

With the new rules in force on the London Metal Exchange, allowing only "standard" tin to be dealt in, it has been impossible for the New York Metal Exchange to get any quotation on Straits of Malacca tin in the London market, and the trade has been dependent on the private cables of the different representatives of the London houses trading in this market. New York has, as usual, followed the ups and downs of the London speculators. The trade here is getting disgusted at being made monkeys of, and it has been proposed to try and get away from the London gang of speculators. We refer to this in the article on the New York Metal Exchange on the preceding page of this issue.

The consumption during the month was very good, 4,000 tons, and the total visible supply is about 2,000 tons less than a month ago.

Tin market is more or less unsettled on account of the uncertainty and upset in England where the working people (who are actually "The People") are about to force the owners of the coal mines to pay to them, the working miners, the wage they demand. These miners today control Parliament, control England, they demand a minimum wage and they get it. Where is it going to end? Pardon this slight digression, but this coal strike in England of 1912 affects tin, affects all the big countries of the world, the miners in England today are making History with a big H, and the people in England do not appear to have one little ghost of an idea of where they are at. It is a bad day for England! We were talking about tin, the price for 5-10-ton lots spot is 43.50, with futures quoted down to 42 cents for far deliveries.

LEAD.

The lead market is all the Trust's, they put the price down to 4 cents, New York, and they are keeping it there. The reason being, the writer believes, to influence the committee in Washington, and we would not be one bit surprised if there was no change made in the lead tariff after all.

The market is held at 4 cents, New York, for carload lots. One cannot buy any quantity or any delivery one may desire, but just what quantity and delivery the merciful Trust will, in its goodness, allow, that you may get when it sees fit!

SPELTER.

The spelter market is very firm again, and it seems to be a difficult matter to secure sufficient of the metal to go around. The severe weather has closed up mines and has held up ore shipments, but against that outdoor work has been stopped, but despite this stoppage the demand has been active and persistent.

The price today for New York delivery, carloads, is 6.85, against about 6.55 a month ago. Sheet zinc has advanced to 8½ cents per pound at the mill.

ALUMINUM.

There has been no change in aluminum. Spot is quotable at 18½ to 19 cents, while round lots of futures can be secured at 18¼ to 18¾ cents per pound.

ANTIMONY.

Cookson's is quoted at 7¼ today, while Hallett's is scarce at 7⅜, Chinese and Hungarian grade at 6¾ cents.

SILVER.

The silver market is rather easier; after selling up to 60⅝ cents in New York the price closed at 58⅝ and 27d. in London, against 59⅞ a month ago.

QUICKSILVER.

The market has been rather firmer, and wholesale price was up to $46 per flask, jobbing lots from $47 to $47.50.

SHEET METALS.

Sheet copper is still quotable at 19 cents base, but wire has been advanced ¼ cent per pound to 15½ cents base. Copper tubing unchanged, but all brass products have been advanced.

OLD METALS.

There has been rather more doing in scrap metals, and the demand from abroad continues good. Prices of all copper scrap is higher again in sympathy with the firmer copper market.—J. J. A.

COPPER PRODUCTION

(Issued by the Copper Producers' Association.)
March 8, 1912.

Stocks of marketable copper of all kinds on hand at all points in the United States, February 1, 1912		66,280,643
Production of marketable copper in the United States from all domestic and foreign sources during February, 1912		116,035,809
		182,316,452
Deliveries:		
For domestic consumption	56,228,368	
For export	63,148,096	
		119,376,464
Stocks of marketable copper of all kinds on hand at all points in the United States, March 1, 1912		62,939,988
Stocks decreased during the month of February		3,340,655

FEBRUARY MOVEMENTS IN METALS

COPPER.	Highest.	Lowest.	Average.
Lake	14.60	14.20	14.40
Electrolytic	14.50	14.00	14.25
Casting	14.25	13.75	14.05
TIN	43.50	44.30	43.45
LEAD	4.30	4.00	4.05
SPELTER	6.85	6.40	6.55
ANTIMONY (Hallett's)	7.50	7.30	7.40
SILVER	.60⅝	.58⅛	.59⅜

WATERBURY AVERAGE

The average price of lake copper per pound as determined monthly at Waterbury, Conn.:

1911—Average for year 12¾. 1912—January, 14½; February 14½.

DAILY METAL PRICES

We have made arrangements with the New York Metal Exchange by which we can furnish our readers with the Official Daily Market Report of the Exchange and a year's subscription to THE METAL INDUSTRY for the sum of $10. The price of the Report alone is $10. Sample copies furnished for the asking. We can furnish daily telegraphic reports of metal prices. Address THE METAL INDUSTRY, 99 John street, New York.

Metal Prices, March 11, 1912

NEW METALS.	Price per lb. Cents.
COPPER—PIG, BAR AND INGOT AND OLD COPPER. Duty Free, Manufactured 2½c. per lb.	
Lake, carload lots	14.60
Electrolytic, carload lots	14.50
Casting, carload lots	14.40
TIN—Duty Free.	
Straits of Malacca, carload lots	43.50
LEAD—Duty Pigs, Bars and Old, 2½c. per lb.; pipe and sheets, 2⅜c. per lb.	
Pig lead, carload lots	4.00
SPELTER—Duty 1⅜c. per lb. Sheets, 1⅝c. per lb.	
Western, carload lots	6.85
ALUMINUM—Duty Crude, 7c. per lb. Plates, sheets, bars and rods, 11c. per lb.	
Small lots	25.00
100 lb. lots	19.50
Ton lots	18.25
ANTIMONY—Duty 1½c. per lb.	
Cookson's cask lots, nominal	7.25
Hallett's cask lots	7.50
Chinese	6.75
Hungarian grade	6.75
NICKEL—Duty Ingot, 6c. per lb. Sheet, strips and wire 35 per cent. ad valorem.	
Shot, Plaquettes, Ingots, Blocks according to quantity	.43 to .60
MANGANESE METAL—Duty 20 per cent	.90
MAGNESIUM METAL—Duty 3 cents per pound and 25 per cent. ad valorem (100 lb. lots)	1.50
BISMUTH—Duty free	2.00
CADMIUM—Duty free	.90
CHROMIUM METAL—Duty 25 per cent. ad val	.98
QUICKSILVER—Duty 7c. per lb.	.65
	Price per oz.
GOLD—Duty free	$20.67
PLATINUM—Duty free	45.50
SILVER—Duty free	.58⅝

Dealers' Buying Prices. Cents per 2 lb.	OLD METALS.	Dealers' Selling Prices. Cents per lb.
12.50 to 12.75	Heavy Cut Copper	13.50 to 13.75
12.00 to 12.25	Copper Wire	13.00 to 13.25
10.75 to 11.00	Light Copper	11.75 to 12.00
10.25 to 10.50	Heavy Mach. Comp.	11.25 to 11.50
8.00 to 8.25	Heavy Brass	9.00 to 9.25
6.00 to 6.25	Light Brass	7.00 to 7.25
7.75 to 8.00	No. 1 Yellow Brass Turnings	8.25 to 8.50
9.00 to 9.50	No. 1 Comp. Turnings	10.00 to 10.25
3.50 to ——	Heavy Lead	—— to 3.75
4.75 to ——	Zinc Scrap	—— to 5.25
5.00 to 5.50	Scrap Aluminum, turnings	6.00 to 7.50
10.00 to 12.00	Scrap Aluminum, cast, alloyed	11.00 to 13.00
14.00 to 15.00	Scrap Aluminum, sheet (new)	16.00 to 17.50
23.00 to 24.00	No. 1 Pewter	25.00 to 26.00
20.00 to 23.00	Old Nickel	23.00 to 26.00

INGOT METALS.	Price per lb. Cents.
Silicon Copper, 20% ..... according to quantity	28 to 30
Silicon Copper, 30% guaranteed " "	30 to 32
Phosphor Copper, guaranteed 10% " "	22 to 25
Phosphor Copper, guaranteed 15% " "	22 to 26
Manganese Copper, 25% " "	35 to 40
Phosphor Tin, guaranteed 5% " "	49 to 50
Brass Ingot, Yellow " "	10 to 10¼
Brass Ingot, Red " "	12 to 13
Bronze Ingot " "	13 to 13⅜
Manganese Bronze " "	17½ to 19
Phosphor Bronze " "	13 to 16
Casting Aluminum Alloys " "	17⅜ to 18⅝
PHOSPHORUS—Duty 18c. per lb. According to quantity	30 to 35

PRICES OF SHEET COPPER.

BASE PRICE, 10.00 Cents. per Lb. Net.

PRICES MENTIONED BELOW ARE FOR QUANTITIES OF 100 LBS. AND OVER.

SIZE OF SHEETS.		64 oz. and over 60 lb. sheet 30 x 60 and heavier.	32 oz. to 64 oz. 25 to 50 lbs. sheet 30 x 60.	24 oz. to 32 oz. 18¾ to 25 lb. sheet 30 x 60.	16 oz. to 24 oz. 12½ to 18¾ lb. sheet 30 x 60.	14 oz. and 15 oz. 11 to 12½ lb. sheet 30 x 60.	12 oz. and 13 oz. 9¼ to 11 lb. sheet 30 x 60.	10 oz. and 11 oz. 7⅝ to 9⅛ lb. sheet 30 x 60.	8 oz. and 9 oz. 6¼ to 7⅜ lb. sheet 30 x 60.	Lighter than 8 oz.
		Cents Per Pound Over Base Price for Soft Copper								
Not wider than 30 ins.	Not longer than 72 inches.	Base	Base	Base	Base	1	2	3	6	9
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	1	3	6	9	
	Longer than 96 inches.	"	"	"	"	2	6			
Wider than 30 ins. but not wider than 36 inches.	Not longer than 72 inches.	"	"	"	"	2	4	7	10	
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	2	6	9		
	Longer than 96 inches. Not longer than 120 inches.	"	"	"	1	3				
	Longer than 120 inches.	"	"	1	2					
Wider than 36 ins. but not wider than 48 inches.	Not longer than 72 inches.	"	"	1	2	4	7	10		
	Longer than 72 inches. Not longer than 96 inches.	"	"	1	3	5	8			
	Longer than 96 inches. Not longer than 120 inches.	"	"	2	4	8				
	Longer than 120 inches.	"	1	3	6					
Wider than 48 ins. but not wider than 60 inches.	Not longer than 72 inches.	"	Base	1	3	6	11			
	Longer than 72 inches. Not longer than 96 inches.	"	"	2	4	9				
	Longer than 96 inches. Not longer than 120 inches.	"	1	3	6					
	Longer than 120 inches.	1	2	4	8					
Wider than 60 ins. but not wider than 72 ins.	Not longer than 96 inches.	Base	1	3	8					
	Longer than 96 inches. Not longer than 120 inches.	"	2	5	10					
	Longer than 120 inches.	1	3	8						
Wider than 72 ins. but not wider than 108 ins.	Not longer than 96 inches.	1	3	6						
	Longer than 96 inches. Not longer than 120 inches.	2	4	7						
	Longer than 120 inches.	3	5	9						
Wider than 108 ins.	Not longer than 132 inches.	4	6							
	Longer than 132 inches.	5	8							

The longest dimension in any sheet shall be considered at its length.

CIRCLES, SEGMENTS AND PATTERN SHEETS, advance over prices of Sheet Copper required to cut them from 3 cents per pound.

COLD OR HARD ROLLED COPPER, 14 oz. per square foot, and heavier, add ..... 1 " " "

COLD OR HARD ROLLED COPPER, lighter than 14 oz., per square foot, add ..... 2 " " "

POLISHED COPPER, 20 INCHES WIDE and under, advance over price for Cold Rolled Copper of corresponding dimensions and thickness ..... 1 " " sq. ft.

POLISHED COPPER, WIDER THAN 20 INCHES, advance over price for Cold Rolled Copper of corresponding dimensions and thickness ..... 2 " " " "

COLD ROLLED COPPER, PREPARED SUITABLE FOR POLISHING, same as Polished Copper of corresponding dimensions and thickness.

COLD ROLLED AND ANNEALED COPPER SHEETS OR CIRCLES, same price as Cold or Hard Rolled Copper of corresponding dimensions and thickness.

ROUND COPPER ROD, ⅜ inch diameter or over ..... **Base Price.**

(Rectangular, Square and Irregular Shapes, Copper Rod, Special Prices.)

	Cents per lb.
ZINC—Duty, sheet, 1⅝c. per lb.	
Carload lots, standard sizes and gauges, at mill	8¼ less 8%
Casks, jobbers' prices	8¾
Open casks, jobbers' prices	9¼

Metal Prices, March 11, 1912

PRICES ON BRASS MATERIAL—MILL SHIPMENTS.

In effect March 1, 1912, and until further notice.

To customers who buy over 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.14½	$0.16	$0.17⅝
Wire	.14¼	.16	.17⅝
Rod	.14¼	.16¾	.18⅝
Brazed tubing	.19¼	—	.22⅛
Open seam tubing	.17⅞	—	.20⅛
Angles and channels, plain	.18¼	—	.20⅝

50% discount from all extras as shown in American Brass Manufacturers' Price List No. 8.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring drawing and spinning brass	½c.	per lb. net advance
" —Best spring, drawing and spinning brass	1½c.	" " " "
Wire —Extra spring and brazing wire	½c.	" " " "
" —Best spring and brazing wire	1c.	" " " "

To customers who buy 5,000 lbs. or less per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.15¾	$0.17¼	$0.18⅝
Wire	.15½	.17¼	.18⅝
Rod	.15½	.18	.19⅝
Brazed tubing	.20½	—	.23⅝
Open seam tubing	.19¼	—	.21⅝
Angles and channels, plain	.19½	—	.21⅞

5% discount from all extras as shown in American Brass Manufacturers' Price List No. 8.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring drawing and spinning brass	½c.	per lb. net advance
" —Best spring, drawing and spinning brass	1½c.	" " " "
Wire —Extra spring and brazing wire	½c.	" " " "
" —Best spring and brazing wire	1c.	" " " "

BARE COPPER WIRE—CARLOAD LOTS.

15.75 per lb. base.

SOLDERING COPPERS.

300 lbs. and over in one order	18½c.	per lb. base
100 lbs. to 300 lbs. in one order	19c.	" " "
Less than 100 lbs. in one order	20½c.	" " "

PRICES FOR SEAMLESS BRASS TUBING.

From 1¼ to 3½ in O. D. Nos. 4 to 13 Stubs' Gauge, 18c. per lb.
Seamless Copper Tubin, 21c. per lb.

For other sizes see Manufacturers' List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron pipe Size	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
Price per lb.	26	25	20	19	18	18	18	18	18	18	18	19	20	22	24	25

PRICE LIST OF IRON LINED TUBING—NOT POLISHED.

	Per 100 feet— Brass.	Bronze.
⅜ inch	$8	$9
½ inch	8	9
⅝ inch	10	11
¾ inch	12	13
⅞ inch	14	15
1 inch	18	20
1¼ inch	22	24
1¼ inch	25	27
1½ inch	32	35
1¾ inch	45	48
2 inch	56	60

Discount 50-5%.

PRICES FOR TOBIN BRONZE AND MUNTZ METAL.

Tobin Bronze Rod	17c.	net base
Muntz or Yellow Metal Sheathing (14" x 48")	15½c.	" "
" " " Rectangular sheets other than Sheathing	17½c.	" "
" " " Rod	15½c.	" "

Above are for 100 lbs. or more in one order.

PLATERS' METALS.

Platers' bar in the rough, 23¾c. net.

German silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturers.

PRICES FOR SHEET BLOCK TIN AND BRITANNIA METAL.

Not over 18 in. in width, not thinner than 23 B. S. Gauge, 2c. above price of pig tin in same quantity.

Not over 35 in. in width, not thinner than 22 B. S. Gauge, 3c. above price of pig tin.

PRICE SHEET FOR SHEET ALUMINUM—B. & S. Gauge.

Wider than..... / and including.....	3in. 12in.	6in. 14in.	14in. 16in.	16in. 18in.	18in. 20in.	20in. 24in.	24in. 30in.	30in. 36in.	36in. 40in.
	in coils.								
No. 13 and heavier	34	34	36	36	36	36	39	39	39
" 14	34	34	36	36	36	36	39	39	39
" 15	34	34	36	36	36	36	39	39	39
" 16	34	34	36	36	36	36	39	39	42
" 17	34	34	36	36	36	36	39	39	39
" 18	34	34	36	36	36	36	39	39	42
" 19	34	34	36	36	36	36	39	40	43
" 20	34	36	36	36	36	38	41	42	44
" 21	34	38	38	38	38	40	43	44	50
" 22	34	38	38	38	40	40	43	47	51
" 23	34	38	38	38	40	40	43	49	52
" 24	34	38	40	42	42	42	45	51	54
" 25	36	39	41	43	43	43	46	53	57
" 26	36	39	42	46	46	46	51	55	61
" 27	36	40	44	48	48	49	54	58	64
" 28	36	40	46	48	49	49	56	62	67
" 29	38	41	48	50	52	52	61	67	72
" 30	38	42	50	52	56	62	69	72	77
" 31	43	47	55	58	63	71	74	77	83
" 32	45	49	57	61	69	77	91	90	95
" 33	47	51	60	65	73	84	91	100	110
" 34	50	55	62	70	78	91	103	110	120
" 35	..	65	70	80	90	100	115	125	..
" 36	..	80	90	100	115	120	135	..	..
" 37	..	104	114	129	144	159	174	..	..
" 38	..	124	139	154	169	184	204	..	..
" 39	..	144	164	184	204	224	..	..	..
" 40	..	174	204	224	244	..	..	..	..

In flat rolled sheets the above prices refer to lengths between 2 and 3 feet. Prices furnished by the manufacturers for wider and narrower sheet. All columns except the first refer to flat rolled sheet. Prices are 100 lbs. or more at one time. Less quantities 5c. lb. extra. Charges made for boxing.

PRICE LIST SEAMLESS ALUMINUM TUBING.

STUBS' GAUGE THE STANDARD. SIZES CARRIED IN STOCK.
Outside Diameters. BASE PRICE, 25 Cents per Pound.

Stubs' Gauge.	Inches.	¼ in.	5-16 in.	⅜ in.	½ in.	⅝ in.	¾ in.	⅞ in.	1 in.	1¼ in.	1½ in.	1¾ in.	2 ins.	2½ ins.	3 ins.	3½ ins.	4 ins.	4½ ins.
11.	.120.	..	..	..	..	..	..	..	27	24	..	..	14	20	10	9	16	23
12.	.109.	..	..	..	..	..	..	..	26	..	..	..	15	..	..	..	..	..
14.	.083.	..	..	..	..	..	..	..	..	..	..	..	17	..	..	..	..	..
16.	.065.	..	..	..	..	..	28	27	27	24	23	21	21	21	21	27	31	37
18.	.049.	..	..	..	..	33	30	29	28	25	26	26	26	..	..	..	..	..
20.	.035.	117	..	46	39	34	33	32	30	29	30	30	30	31	38	49	58	81
21.	.032.	..	..	..	40	..	..	..	..	..	..	..	..	..	..	..	..	..
22.	.028.	138	98	48	42	38	37	35	34	..	..	45	..	..	..	..	..	..
24.	.022.	188	133	108	88	79	73	62	60	66	..	..	..	..	..	..	..	..

Prices are for ten or more pounds at one time. For prices on sizes not carried in stock send for Manufacturers' List.

PRICE LIST FOR ALUMINUM ROD AND WIRE.

Diameter. B. & S. G'ge	000 to No. 10.	No. 11.	No. 12.	No. 13.	No. 14.	No. 15.	No. 16.	No. 17.	No. 18.	No. 19.	No. 20.	No. 21.	No. 22.
Price, per lb.	32	32½	32½	33	33½	34	34½	35	36	37	38	43	46

PRICE LIST FOR GERMAN SILVER IN SHEETS AND ROLLS.

Per cent.	Price per lb.	Per cent.	Price per lb.
12	$0.52	16	$0.58
13	.53	17	.59
14	.54	18	.60
15	.55		

These prices are for sheets and rolls over 2 inches in width, to and including 8 inches in width and to No. 20, inclusive. American or Brown & Sharpe's Gauge. Prices are for 100 lbs. or more of one size and gauge in one order. Discount 50%.

GERMAN SILVER TUBING.

4 per cent.	to No. 19,	B. & S.	Gauge,	inclusive	$0.60
6 "	" 19,	"	"	"	.70
9 "	" 19,	"	"	"	.85
12 "	" 19,	"	"	"	1.00
15 "	" 19,	"	"	"	1.15
16 "	" 19,	"	"	"	1.20
18 "	" 19,	"	"	"	1.30

German Silver Tubing thinner than No. 19 B. & S. Gauge add same advances as for Brazed Brass Tube.

For cutting to special lengths add same advances as for Brazed Brass Tube. Discount 40%.

PRICES OF SHEET SILVER.

Rolled sterling silver .925 fine is sold according to gauge quantity and market conditions. No fixed quotations can be given, as prices range from 2c. below to 6c. above the price of bullion.

Rolled silver anodes .999 fine are quoted at 2c. to 3½c. above the price of bullion.